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ABSTRACT

Health Manpower Legislation and related research aspects are the topics of this report. The program of the Comprehensive Health Manpower Training Act of 1971 played a major role in the medical school enrollment expansion that occurred between 1971 and 1973. Medical school admissions decisions have been responsible to federal policy objectives and broader social concerns regarding equality of access for women and minorities. Primary care physicians need and are choosing speciality training, whether in family medicine or one of the more traditional specialities of internal medicine, pediatrics, or obstetrics-gynecology. Although public schools and private schools have increased real tuition levels during the past decade, the spread between the two has increased. The strong technical interdependencies among patient care, research, and education in academic health centers mean that there are strong interdependencies between federal decisions in the health manpower field and federal decisions in other health care areas. Greater reliance on clinical faculty earnings for institution support will require that clinical care in teaching hospitals be oriented more toward secondary and tertiary than toward primary care. Government proposals for the use of special projects to promote primary care may compensate for the financial problems associated with primary care training as well as for those created by cutbacks in general institutional support. (Author/PG)

FEDERAL MANPOWER LEGISLATION AND THE ACADEMIC HEALTH CENTERS: AN INTERIM REPORT

ED 095 139

PREPARED FOR THE HEALTH RESOURCES ADMINISTRATION AND THE OFFICE OF THE ASSISTANT SECRETARY FOR PLANNING AND EVALUATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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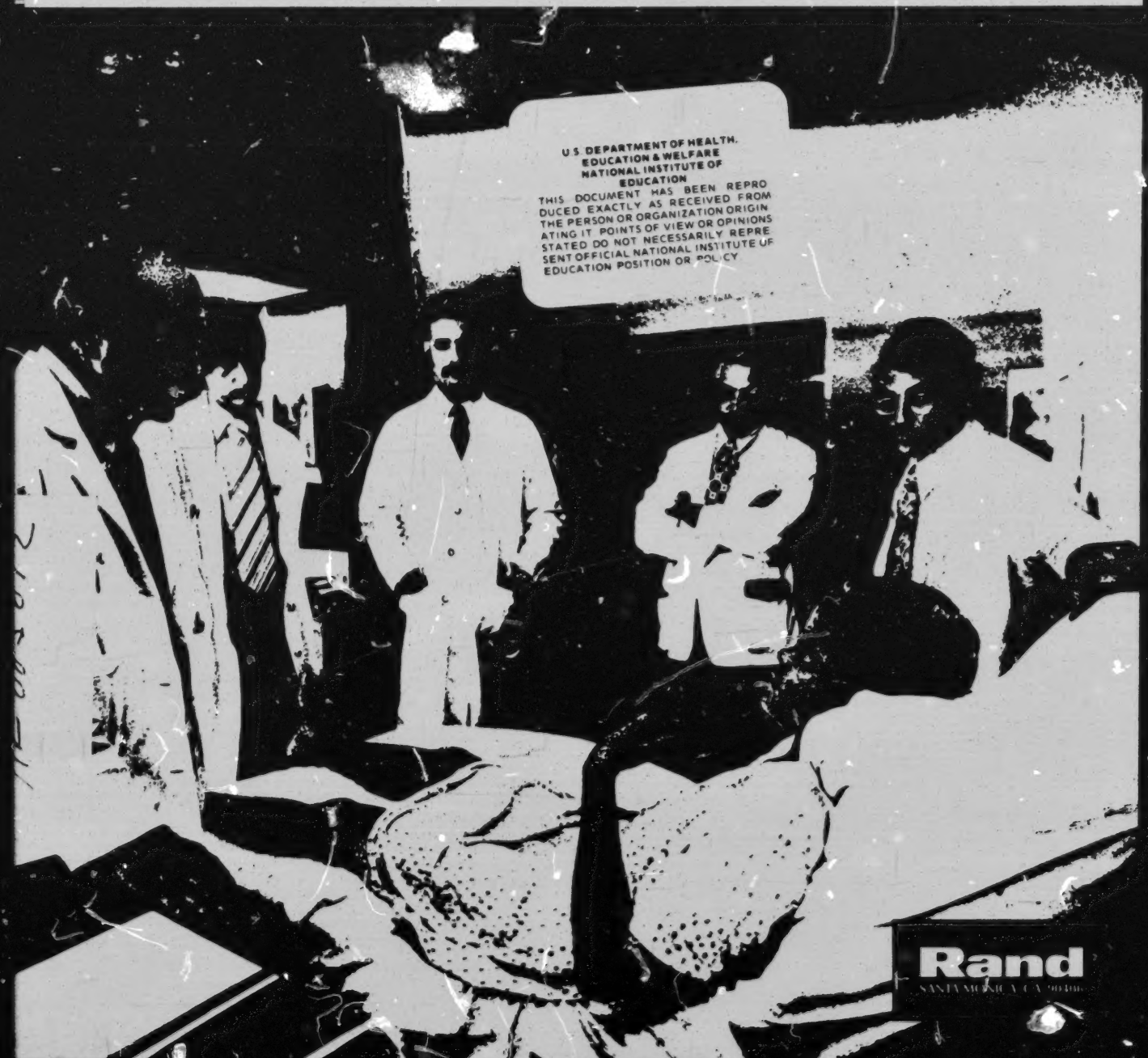

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PREFACE

The research in this report was performed under contract with the Bureau of Health Resources Development of the Health Resources Administration and the Office of the Assistant Secretary for Planning and Evaluation, Department of Health, Education and Welfare. It is part of a larger study of the effects of federal programs on academic health centers.

The academic health center is an organizational complex that includes a medical school, at least one and usually several teaching hospitals, and often semi-autonomous research institutes as well as other health professional schools. The federal effects on the centers stem from the activities of a dozen federal agencies administering well over 100 distinct programs. The focus of this study is on understanding the effects of these programs on the operations of the centers and on the composition and mix of their outputs of education, research, and patient care.

This report deals with aspects of the research related to health manpower legislation. The research is still in progress. However, the schedule of the debate on legislation to replace the Comprehensive Health Manpower Training Act of 1971 is such that results of the work must be made available now to insure they are relevant to policy formulation. Thus, some of the findings are preliminary, as indicated in the text. These aspects of the analysis will be treated more comprehensively in subsequent reports.

SUMMARY

The capitation program of the Comprehensive Health Manpower Training Act of 1971 (CHMTA) played a major role in the medical school enrollment expansion that occurred between 1971 and 1973. Schools that had not expanded enrollment appreciably before took part in the expansion mandated by capitation, and a substantial proportion of the schools that had increased enrollment in response to earlier programs would probably not have increased further in the absence of capitation grants. Federal program incentives for further expansion would probably elicit a response from a number of schools that face no important constraint to further growth. However, perhaps as many as one-fifth of the schools would encounter difficulty in obtaining a sufficient teaching patient population to support further growth. The quality of the national applicant pool does not appear to be a constraint to substantial further expansion.

Medical school admissions decisions have been responsive to federal policy objectives and broader social concerns regarding equality of access for women and minorities. Our models of admissions processes suggest that discrimination against women applicants is no longer significant; in some instances, women are given preferential treatment. The schools have made great efforts to evaluate minority applicants using criteria that reduce or eliminate cultural biases. Although some important barriers to access to medical education have been removed, it is not true that all applicants to a particular medical school are judged equally on the basis of their qualifications to become physicians. State schools, as well as private schools that receive state support, discriminate strongly in favor of state residents in their admissions processes.

Primary care physicians need and are choosing specialty training, whether in family medicine or one of the more traditional specialties of internal medicine, pediatrics, or obstetrics-gynecology. The more supervised ambulatory care this training includes and the earlier it is introduced in the medical education process, the higher will be its costs in terms of institutional funds the academic health center must provide. Third-party reimbursement rules for the professional component of patient care make primary care, particularly ambulatory care, a financially unattractive use of centers' professional resources.

There are some differences in the proportion of graduates entering primary care specialties between institutions and over time. However, the reasons for these differences are difficult to detect. They seem to be the result of interplay between individual background and preferences and subtle differences in the institutional environment. In any case, there are no statistically significant relationships between simple institutional variables (for example, the size of a center's research program, its concentration on postgraduate medical education) and the specialty decisions of a medical school's graduates.

Although public schools and private schools have increased real tuition levels during the past decade, the spread between the two has increased. Bargaining over burden sharing of the education cost component of academic health center budgets is central to debate on tuition policy, but the inevitable limitations of cost allocation in joint production processes precludes any unambiguous determination of costs. Returns to the individual investment in medical education appear high enough that the investment would be attractive on purely economic grounds even if tuition levels were increased substantially. However, noneconomic factors are clearly important

in physicians' career choice decisions, and thus it is difficult to assess how tuition increases would affect the supply of qualified applicants to medical school. For those who are admitted to medical school, there appear to be no financial barriers to completing medical education because of currently available scholarships and loan programs.

An important aspect of the tuition policy problem is the difference between state and private schools. Private school tuition levels appear to be strongly influenced by the institution's financial position and are largely under the control of the school administrators. However, tuition at state schools is usually set at the state government level where tuition increases are unpopular with legislators. Increases that widen the current large spread between public and private school tuition would strengthen public schools, which largely restrict admission to state residents, and weaken private schools, which try to draw the most qualified applicants from a broader applicant pool.

The strong technical interdependencies among patient care, research, and education in academic health centers mean that there are strong interdependencies between federal decisions in the health manpower field and federal decisions in other health care areas. Since federal programs are generally funded on a basis that is more generous than the concept of strictly marginal cost (but less generous than the cost of starting from scratch), any cutback in ongoing programs will result in an increase in the funding requirements for the remaining programs since they will be required to assume a larger share of joint costs. The strength of this effect on the perceived costs of core undergraduate education programs will differ widely by type of cutback. Reductions in flows of funds in support of research training (training grants) will tend to result in a much larger proportionate increase in the funding requirements for the core undergraduate education programs than will reductions in flows of funds to research itself. Reductions in flows of funds from patient care programs (such as would be implied by the proposed changes in Medicare professional reimbursement rules) will have a particularly strong effect on education funding requirements. In addition, federal price-control policy has substantial effects on the costs of medical education perceived by academic health center administrations. Although many schools feel that maintenance of the recently expanded level of undergraduate education will require either new hospital affiliation agreements or enlargements of existing agreements, price controls make it very difficult for hospitals to assume fiscal responsibility for educational programs that were not in existence at the time these controls went into effect.

As funding requirements increase relative to funding, the academic health centers will be forced to take more complete advantage of the willingness of their faculty to pay a "price" in terms of forgone income for the "privilege" of teaching and research. This bargaining thrust will result in a decrease in the average proportion of faculty time devoted to teaching (and hence an increase in faculty-student ratios) as center administrations take advantage of the fact that the price of time in patient care tends to be greater than the average price at which faculty time is supplied. Since the price of teaching time is less for clinical faculty in the high-earning specialties than for faculty involved with primary care, this change in bargaining will also result in a bias against the employment of primary-care specialists. Paradoxically, the reduction in funding requirements achieved through bargaining for a lower implicit price of teaching time will tend to yield both higher observed faculty incomes and higher faculty-student ratios.

The effect of the 1971 act on the financial position of the medical schools is less clear than its effects on enrollment. We do not find any direct relationship between educational objectives and financial difficulty in the past. The factors that were

related to financial distress—private school status, difficulty in securing research grants, a restricted supply of teaching patients and a dependence on volunteer faculty—are hard to change in the short run. The 1971 act successfully substituted the capitation grant for the financial distress grant as a mechanism for financing medical school operating costs, but it could not affect the factors underlying past financial difficulty. A substantial reduction in capitation grants, without provision of a substitute, might lead some schools again to petition the federal government for special support.

A question of particular interest is the extent to which individual schools could substitute research grant funds to cover more of the joint costs of medical education. Analysis of recent NIH priority scores suggests that the slowdown in the growth of available funds has not affected the integrity of the peer review process. As a result, schools with weak research programs—which also tend to be schools likely to encounter financial difficulty in any significant reduction of operating support—will find it difficult to increase their share of research funds to replace capitation grants in covering joint costs.

We do find that the considerable federal interest in expanding enrollment has changed the pattern of institutional growth. Whereas in the past size of faculty was related to the extent of the research effort, since the late 1960s changes in department size have been more closely related to educational responsibilities.

Although the shape of the next health manpower legislation remains to be determined, we speculate on likely effects of current proposals for cutbacks in federal institutional support. Academic health centers would almost certainly react to such cutbacks by simultaneously seeking replacement funds and altering programs; the principal sources of replacement funds are likely to be tuition increases, state appropriations, and clinical faculty practice earnings.

We expect more private schools to raise tuition to the $4,000 level, the highest currently charged. However, we believe that most private schools will be reluctant to exceed that level in the absence of comparable increases by state schools. In most state schools, tuition rates are set by the state government. What the tuition decisions of these bodies will be is difficult to predict, but tuition increases are in most cases no more attractive politically than increased state appropriations. Where states provide funds through direct appropriations to either state or private schools, one might expect legislators to seek more discrimination in medical school admissions in favor of resident applicants.

Greater reliance on clinical faculty earnings for institutional support will require that clinical care in teaching hospitals be oriented more toward secondary and tertiary than to primary care. Since third-party professional reimbursement rules favor the surgical and procedurally oriented medical specialties over the primary care specialties, increasing professional revenue requires shifting the mix of care provided. Government proposals for the use of special projects to promote primary care may compensate for the financial problems associated with primary care training as well as for those created by cutbacks in general institutional support.

ACKNOWLEDGMENTS

A little more than two years ago, we began this study with no personal experience in research on academic health centers. Many people have helped us to gain the understanding of center operations necessary for effective analysis, but our greatest debt is to deans, department chairmen, faculty, house staff, and medical students at the ten centers in our sample. They gave generously of their time and were patient both in answering our questions and in helping us formulate them better. Even if they were identified, we believe that it would be impossible to match data in this report with individual centers. However, at this time, we choose not to identify any of the ten centers or anyone associated with them to make doubly sure.

We recognize that the active cooperation of the Association of American Medical Colleges has been a very valuable asset in obtaining the cooperation of the centers and access to standardized data sources such as the American Medical College Admissions Service and the Faculty Roster. We have also been aided greatly by the personal guidance and criticism of John A. D. Cooper, August Swanson, Marjorie Wilson, Jerry Kurtz, and the late Joseph Murtaugh. Our analysis of graduates' career patterns would have been impossible without the cooperation of Chris Theodore in authorizing our access to the American Medical Association's Master File of Physicians.

Many have contributed to our understanding of the federal government involvement with academic health centers, but we should particularly like to thank Stuart Altman, Stan Wallack, Marvin Dunn, David Tilson, Richard Stephenson, Herbert Rosenberg, Ann Kaufman, Solomon Eskenazi, William Rhode, and Carl Douglass for help and criticisms in this part of our work.

We thank Rand colleagues Joseph Newhouse, Charles Phelps, Emmett Keeler, and Adele Massell for comments and criticism of our work, but we are particularly indebted to Paul Berman and Bridger Mitchell, the formal reviewers for this report. Robert Bell, Carolyn Lee, Elbert Washington, and Wendy Cooper sustained our research. Kent Brown developed and maintained our complex computer based data files. Finally, the readability of this report owes much to the editing of Helen Turin.

If the length of these acknowledgments seems inordinately great, it is because we received help from so many people. Of course, we bear the full responsibility for mistakes that may remain.

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I. INTRODUCTION

All major health manpower legislation will expire on June 30, 1974. Although the federal budget message that was submitted to Congress in late January 1974 of necessity contained general statements with regard to the Nixon Administration's proposals for successor legislation to the Comprehensive Health Manpower Training Act, the debate over the specific provisions of that legislation will continue through most of 1974. The first round of the debate occurs within the Executive branch as specific administration proposals are formulated. At the same time, Congressional staffs work on the health manpower initiatives of their Senators and Congressmen. These two parallel activities merge in the hearings before the cognizant committees of the Congress, proceed to the floor of the House and Senate, and finally are resolved in joint conference committee.

This report is part of a larger study of the effects of federal programs on academic health centers. The timing was agreed upon approximately two years ago in anticipation of the legislative process schedule outlined above. The plan was to draw from the research in progress results that seemed relevant to formulation of new health manpower legislation. We expected that the general manpower policy issues would be articulated well before this report was due. We now realize that many of the issues are too complex to be clearly—or at least easily—articulated, and the nation's health policymakers have not had the luxury of concentrating on manpower issues this year. Rather they have been forced to spread their attention across an extraordinarily broad range of urgent policy problems: research training, price controls of health care, impounding of funds, human experimentation, and national health insurance, to name a few.

At the time we began this research, we also expected that most research for manpower legislation could be completed relatively early in the course of our study. To some extent that was true of the research relevant to provisions of the Comprehensive Health Manpower Training Act of 1971. That legislation was principally concerned with expanding enrollment in medical schools and providing equality of opportunity for careers in health professions. The admissions process of medical schools was the principal institutional mechanism that the 1971 legislation sought to influence. We feel our research describes a great deal about that process that is relevant to federal concerns. However, having learned much about how medical schools now select students from among large applicant pools and how that has changed, we realize that it is only a first step in determining the supply of physicians available to a changing health care delivery system. Public policy is no longer concerned simply with getting more doctors but with a wide range of physician characteristics that are at best only loosely described. This has led us to research that considers a much larger range of attributes of the medical education output than we had expected two years ago.

STUDY DESIGN

Although the various sections of this report dealing with aspects of the health manpower policy problem are self-contained and comprehensible to the reader without reference to other material, a general understanding of the larger study will facilitate interpretation of the results we report. For this reason we briefly summa-

rize the study objectives, the principal elements of our analytic approach, and the sources from which we have drawn data.

The larger study is concerned with describing the effects of federal programs on academic health centers. The broad concern with federal programs—rather than just the programs of the Department of Health, Education and Welfare—stems from the scope and complexity of federal influence on the centers. One can readily identify a dozen different federal agencies administering more than 100 distinct programs that directly involve the part of the medical education community we call the academic health centers. In addition, the federal government has become increasingly involved in regulatory activity that impinges on the centers, of which price controls are only the most obvious. We offer no judgment regarding the wisdom of such an extensive federal role, only that it would be unwise to try to assess federal influence by limiting the study to activities within the boundaries of one or another federal agency.

The term "academic health center," which describes the subjects of our analyses, also requires clarification. Our concern is with the organizational entities that are integral parts of the system that provides formal education to physicians. Too many would regard the medical schools as the relevant organizations for such an inquiry, but a medical school is only one—albeit an important one—of the corporate entities directly involved in a physician's education. The medical school may be viewed as the unifying component of a complex of organizational entities involved in the simultaneous and joint production of education, research, and patient care.

The medical school bears exclusive responsibility for only the first year, or at most the first two years, of a physician's education. Education in the clinical sciences is the joint responsibility of the medical school and one or more teaching hospitals; these hospitals assume a major role in the postgraduate education of the M.D. Biomedical research is an important ingredient in the medical education conglomerate, and research activities are often conducted under the auspices of affiliated but corporately distinct research institutes.[1] Thus the academic health center's boundaries are determined by the interrelationship of functions rather than the formalities of organizational authority. The interrelationship of functions also dictates consideration of all three categories of outputs: education, research, and patient care; and that consideration is reinforced by federal policy objectives and program involvement in each of those spheres.

The key problem of study design is to make analysis of such broad scope and such complex organizations manageable. The inadequacy and noncomparability of readily available data to describe operations dictate studying the centers from within. However, the analysis must find bases for generalizing results because the federal government cannot tailor its programs to the peculiarities of each center.

The study deals with the problems of generalization by developing a common framework for analyzing the operations of representative centers within the country. The common framework is a set of models, in the most general sense of the term, that describe the principal factors affecting decisions in six spheres of activity: (1) allocation of resources; (2) organization of clinical services; (3) management of research; (4) selection of students; (5) selection, assignment, and promotion of faculty; and (6) development of curriculum. The models are aimed primarily at revealing the

[1] Many academic health centers contain other health professional schools (such as dentistry, pharmacy, nursing, and allied health) within their nominal organizational boundaries. Since our study is concerned with the activities that are integral to the education of physicians, the inclusion of these other education programs in our analysis depends on their direct relationship to the medical school curriculum. In general, we have found that these other programs proceed largely independently of physician training, even though they may be within the same corporate entity.

effects of federal program instruments in achieving public policy objectives. However, since federal programs constitute only one of a number of forces affecting the centers' outputs, the models take account of other forces both external to and within the centers.

Analysis of this sort is both too expensive and too time consuming to perform in a large number of centers. This necessitated a sampling procedure that would insure reasonable representativeness with an economical number of centers. We felt these objectives could be achieved for purposes of our analysis by studying 10 centers out of the 94 that had fully operative M.D. granting programs in the 1972–1973 academic year.

We approached the representativeness problem by selecting 31 variables that described important aspects of center functions and on which data were available to us for all centers. The variables included numbers of different categories of students, the size of teaching hospital facilities, federal program assistance of different types, the classification of the school as public or private, and so on. These 31 variables were then reduced by factor analysis to six synthetic variables or dimensions that described important characteristics of each center: the size of the M.D. education program; the involvement in postgraduate M.D. education; the size of the non-M.D. education effort; a state school to private school continuum; the reliance on nonfull-time faculty; and involvement in NIH research.[2]

Since each center is at a particular point on each of these six dimensions, this system of synthetic variables provides a way of "locating" the centers in six-dimensional space. Within this space a mathematical clustering procedure was used to develop ten groups of centers that were "close together" when all six dimensions were considered. These groups or clusters were the basis on which we selected ten centers to be representative of the larger population.[3]

The term "selection" should not be construed to mean that the choice of sample centers was solely our prerogative or that of our research sponsors. Proceeding with a study that examined medical centers from within required a high degree of access to the administrators, faculty, and data of each center. To obtain such access, we had to convince the leadership of each center that: (1) our approach was objective; (2) our study would have potential policy reliance; (3) our analysis would probably yield results of interest to the particular center; and (4) most important, neither data nor analysis would be reported in such a way as to compromise the identity of centers or individuals without their explicit approval. Given these conditions, we encountered no difficulty obtaining access to a representative group of centers.[4]

The data for the study largely relate to the activities of these ten centers, although we have a limited number of data series that contain information on all centers in the United States. The data fall into three broad categories. One comprises data drawn from a series of meetings with deans, hospital administrators, department chairmen, faculty, house staff, and students at each of the centers. Most of these data are from structured interviews—not formal surveys—with individuals,

[2] A technical description of our use of factor analysis and cluster analysis is beyond the scope of this report. Such a description will appear in the forthcoming Rand report, *Finding Representative Academic Health Centers*. The use of the same general methodology to classify cities is contained in Emmett Keeler and William Rogers, *A Classification of Large American Urban Areas*, R-1246-NSF, The Rand Corporation, May 1973.

[3] At points in the factor and cluster analysis process, we consulted with individuals at the National Institutes of Health and the American Association of Medical Colleges who were familiar with a large number of centers. Their comments were always helpful, and their evaluation of the clusters and recommendations on choices from within clusters were particularly valuable.

[4] Only one center that we asked to participate declined on the understandable grounds that they were currently involved in three extensive studies and felt that a fourth study would be both too disruptive and subject to faculty fatigue. We encountered no difficulty in finding a satisfactory substitute.

but they also include notes on attendance at, for example, admissions committee meetings. We have used this category extensively to develop our general understanding of the decisionmaking processes of the centers and to formulate hypotheses that could be tested more rigorously with quantitative data. A second category comprises the quantitative data collected from individual center files: student records, budget data, faculty promotion history, and hospital patient composition, to name a few. These are important inputs to our formal analysis. The third category is also related to individual centers and is quantitative in nature. However, it is drawn from third parties, such as the American Medical Association (AMA), the Association of American Medical Colleges (AAMC), the Institute for Scientific Information, specialty boards, and so on. These data series are highly desirable because their uniform formats enhance their usefulness as bases for comparisons among centers.

SCOPE OF THIS REPORT

As we have indicated, this report differs in two significant respects from what we planned. First, the issues are more complex than we originally thought, and hence we have found ourselves not only trying to address our research to immediate policy questions but also trying to formulate many of the questions more clearly. Second, as we have formulated these questions, we realize the limitations of the answers we are able to provide.

The sections of this report of work in progress vary in the comprehensiveness with which they treat the subject matter. Section II describes the evolution of federal health manpower legislation up to the present and should provide the reader with a historical perspective for the remainder of the report. The next section, on enrollment expansion, reports factual information systematically. Section IV, on student admissions, reports on our comprehensive analysis of the admissions processes, conducted for 10 schools in 1972 and several schools for earlier years. This analysis clearly establishes changes of federal policy interest, but in doing so leads us to formulate hypotheses about admissions that are of public policy concern and require more analysis to test. Section V contains a preliminary examination of the problems of providing primary care training in academic health centers and the factors that appear to influence the individual's choice of graduate training program and specialty. Section VI, on tuition policy considerations, presents a number of facets of the problem that are relevant to federal policy interest in shifting more of the financial burden of medical education to the student. Section VII describes the nature of the financial interdependencies of polices and programs affecting academic health centers. It deals with an extremely complex subject in a relatively short space and thus makes no pretense at comprehensiveness beyond outlining the most important problems.

Section VIII, on institutional finance, describes preliminary results of analysis that will be treated in more detail in later reports. Finally, the conclusion reviews the findings of the preceding sections and offers speculation on possible effects of some program proposals that are being considered for inclusion in new health manpower legislation.

Although we expect the quality of our answers to health manpower questions to improve with more research, we are not reluctant to offer interim results for consideration in the policy process. We are not so naive about that process to expect it will wait for the formulation of unambiguous questions, much less unambiguous answers. Good decisions take into account the information at hand. This report is designed to provide that sort of information at this stage of our research.

II. OVERVIEW OF PHYSICIAN MANPOWER LEGISLATION

EVOLUTION OF INSTITUTIONAL SUPPORT

By the late 1950s, the federal government had clearly emerged as a major source of support for post-M.D. training, especially in psychiatry and medical research.[1] Attempts to extend similar support to pre-M.D. training, however, had long been successfully opposed by the American Medical Association.[2] Backed by a series of blue-ribbon reports citing a physician "shortage" and urging federal support to expand medical student enrollments,[3] the Kennedy Administration proposed a ten-year program to construct teaching facilities and provide scholarships. With the passage of the Health Professions Educational Assistance Act (HPEA) in 1963, the federal government began its first significant support for physician training at the pre-M.D. level.

The act passed by Congress differed in two significant respects from the administration proposal. Whereas the administration wished to support construction of teaching facilities for medicine, dentistry, and public health—the areas of presumed shortage—the act offered matching grants to almost all the health professions: medicine, osteopathy, dentistry, public health, optometry, pharmacy, podiatry, and nursing.[4] In addition, the act substituted student loans for the proposed program of medical and dental scholarships.[5] The scholarship program had to wait until the act

[1] Support for psychiatric residencies was provided by the National Institute for Mental Health, under the 1946 National Mental Health Act. Post-M.D. research fellowships were initiated in the 1930s, with the creation of the National Institutes of Health and the National Cancer Institute. After World War II, NIH began a program of research training grants that combined stipends for postdoctoral fellows with departmental support for related teaching costs, especially faculty salaries.

[2] For an account that is sharply critical of the AMA, see Elton Rayack, *Professional Power and American Medicine: The Economics of the American Medical Association*, Cleveland, World Publishing Co., 1967, Chapter 3.

[3] *Physicians for a Growing America*, Report of the Surgeon General's Consultant Group on Medical Education, Washington, D.C., 1959; *The Advancement of Medical Research and Education through the Department of Health, Education and Welfare*, Final Report of the Secretary's Consultants on Medical Research and Education, Washington, D.C., 1958; *Federal Support of Medical Research*, Report of the Committee of Consultants on Medical Research to the Subcommittee on the Departments of Labor, and Health, Education and Welfare of the Committee on Appropriations, U.S. Senate, 86th Congress, 2nd Session, May 1960.

[4] The grants could finance up to two-thirds of the cost of new construction and up to 50 percent of the cost of alterations and renovations (75 percent in the case of schools of public health). They could support construction of affiliated hospitals and other clinical facilities, provided the space was needed for teaching and assistance was not available under the Hill-Burton program. The act provided that applications for funds be judged in terms of expanding training capacity and that the program be administered with regard for equitable geographical distribution of federal assistance. No priority was given to any particular health profession, but the House and Senate committee reports emphasized the needs of medical and dental schools.

[5] The act authorized a 90 percent federal contribution to revolving student loan funds, with the schools responsible for providing the remaining 10 percent. Loans to any individual were limited to $2000 per year, with the funds repayable over a ten-year period beginning three years after graduation (reduced to one year by the Health Manpower Act of 1968, but with provision for deferment during residency training and military service). Interest began to accrue when the loan became repayable, and since FY 1970 the interest rate has been 3 percent per year.

The loan authority was subsequently amended in a number of other ways. Originally limited to students in medicine, osteopathy, and dentistry, coverage was extended to students in optometry (1964), pharmacy and podiatry (1965), and veterinary medicine (1966). The maximum size of the loan was raised to $2500 per year, and 50 percent forgiveness was offered to students practicing in an area of manpower shortage, at the rate of 10 percent for each year of service (1965). Full loan forgiveness (at the rate of

was amended in 1965.[6]

Of perhaps greater importance, the 1965 amendments authorized the first federal support for operating costs, through a program of educational improvement grants. Two types were provided. All accredited schools of medicine, osteopathy, dentistry, optometry, and podiatry meeting a minimum requirement for enrollment expansion could apply for a basic improvement grant. (The enrollment increase could be waived if limited facilities threatened to lower educational quality.) In the first year of the program (FY 1966), these grants paid the typical medical school about $200 per student; in subsequent years (FY 1967 through FY 1969), the typical school received approximately $550 per student.[7]

The second type of award authorized by the 1965 amendments was the special improvement grant, to strengthen a school's accreditation status or maintain special functions. Because special improvement grants were paid from funds remaining after the obligations of the basic improvement grant program were met, no special improvement awards were made until FY 1968. In the early years of the special improvement program (FY 1968 and FY 1969), most of the awards went to assist schools in serious financial straits, especially those that claimed a lack of funds threatened their accredited status. These were the first of the so-called "financial distress" grants.

The Health Manpower Act of 1968 extended the HPEA Act for an additional two years. Besides adding veterinary medicine and podiatry to the list of health professions schools eligible for basic and special improvement grants, the act mandated a second round of enrollment increases.[8] As before, the Secretary of HEW might waive the required enrollment increase if physical facilities limited a school's ability to expand without detriment to the quality of the educational program. Although the amount received per student remained on average the same in FY 1970 and FY 1971 as in FY 1967–69 (about $550 per medical student), the award formula was changed to encourage expansion of enrollment.[9] The act also required that schools continue to expend from nonfederal sources at least as much as the average for the preceding three years.

The 1968 act made several minor changes in the loan and scholarship program and allowed separate funding of special improvement grants, whose name was changed to special project grants. The FY 1969 limit of $400,000 for an individual special project grant was removed, and priority in awarding grants was assigned to

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15 percent per year) was offered to those practicing in rural areas characterized by low family income (1966). (Loan forgiveness was limited to students in medicine, osteopathy, dentistry, and optometry.)

[6] The legislation set a maximum amount of $2500 on an individual scholarship and authorized awards to students in medicine, osteopathy, dentistry, optometry, pharmacy, and podiatry. Students in veterinary medicine were added in 1968.

Also in 1968, the health professions schools were given added flexibility in the management of loan and scholarship funds, with the right to transfer up to 20 percent from one award to the other in any single year. The practical effect of this change was to increase funds available to the scholarship program beyond the budget appropriation, by making a transfer from the loan to the scholarship award.

[7] The authorized level of awards was $12,500 plus $250 per full-time student in FY 1966, and $25,000 plus $500 per student in FY 1967 through FY 1969. Actual awards depended on the amount of funds appropriated by Congress, and were determined on a *pro rata* basis.

[8] To receive a basic improvement grant in FY 1970 or FY 1971, a school had to increase its first-year enrollment by 2-1/2 percent or five students, whichever was greater, over its highest two years of first-year enrollment in the period 1 July 1963 to 30 June 1968.

[9] The formula provided that each participating school would receive a basic grant of $25,000. After payment of the basic grants, the remaining appropriated funds would be divided into two "pots." The first would receive 75 percent of the remaining monies and would be apportioned among the schools on the basis of enrollment. The second would receive the balance of available funds and would be divided among the schools based on the number of graduates. In the computation of enrollment, increases beyond the mandated expansion counted twice.

projects that would increase enrollment, ease financial distress, improve the curriculum, or reduce the period of training. In keeping with the emphasis on expanding enrollment, the administration earmarked $10 million of the FY 1970 budget for a Physician Augmentation Program. The goal was an increase of 1000 first-year places over the number originally planned for the fall of 1970.[10]

The 1968 act also enlarged the provisions of the construction program. Not only might the Secretary exceed the 50 percent limit on the cost of alterations where special circumstances warranted, but assistance was now authorized for multipurpose facilities. Under the 1963 act, support for clinical space related to teaching could be included in the grant, but only limited support was available for research space and library facilities.[11] Most funds for these purposes had to come from separate applications to the health research facilities construction program and the medical library construction program. Moreover, the 1963 act excluded assistance for postgraduate facilities. With the 1968 act, a school might apply to the health professions program for a project that included clinical, research, library, and postgraduate training space, provided the facility would be primarily used for the teaching of candidates for the M.D. or other first professional degree.[12]

THE COMPREHENSIVE HEALTH MANPOWER TRAINING ACT OF 1971

When the HPEA Act came up for renewal in 1971, the federal government was seriously concerned about the nature and extent of its responsibility for the financial position of the health professions schools in general, and the medical schools in particular.[13] It had undertaken that responsibility because of its interest in maintaining—and, if possible, increasing—the supply of health professionals. However, by FY 1971, 62 of the nation's 108 medical schools were receiving financial distress grants, and the typical grant was twice the size of a school's basic improvement award. These grants placed the federal government in the position of providing residual financing ("last-dollar" financing). Not only was this an open-ended commitment, but some were concerned about the potential for federal intervention in the management of individual schools. The alternative was to expand programs of "first-dollar" financing, such as the basic improvement grant, which provided each school with a floor of federal support regardless of its financial position. If the federal government chose this alternative, it would be paying "rents": that is, making grants to schools that were not in immediate need of federal funds. Although these grants might replace funds that would otherwise be provided by state governments or the private sector—an indirect form of revenue sharing—a change to first-dollar financing would remove the potential for federal intervention. The choice was one between a targeted program in which the schools had to justify their needs to the

[10] About 500 first-year places were actually added under this program (House of Representatives, Committee on Appropriations, Subcommittee on Departments of Labor and HEW, *Hearings, Departments of Labor and HEW Appropriations for 1971*, Part 2, p. 21).

[11] As a matter of administrative policy, support was allowed for research space not to exceed 5 percent of the space eligible for assistance under the program. Support was also briefly allowed for medical library facilities (until passage of the Medical Library Assistance Act in 1965).

[12] Clinical, research, and library space could be justified either as essential for teaching or as part of a facility where 75 percent of the space qualified for the program. The proportion of faculty time devoted to research is generally the criterion for determining how much research space is essential for teaching.

[13] One indication of concern was the special report ordered by the Health Training Improvement Act of 1970: Department of Health, Education and Welfare, *Financial Distress Study Report*, December 1971.

federal government, and a formula grant program in which each school would be given a basic grant to spend as it pleased.

After considerable internal debate, the Nixon Administration selected the "first-dollar" approach. Basic improvement grants would be replaced with a capitation program, paying each school $6000 per graduate in medicine, osteopathy, and dentistry. As Secretary Richardson testified:

> The $6,000 is not intended to represent a cost-of-education price, but rather . . . a reasonable Federal share of funds provided to the schools to help them stabilize their finances. These funds will be used by the institutions in any way they wish to develop educational programs and achieve financial stability.[14]

No enrollment increase would be required as a condition of participation. Financial distress assistance would be continued for a limited number of schools but with stress on its temporary nature.

Besides a capitation program, the Nixon Administration proposed several other changes in the structure of institutional support. Special project grant authority for medicine, osteopathy, and dentistry would be separated from the other health professions. A new program of Health Manpower Initiative Awards would be started to fund Area Health Education Centers and other health training programs. Allocation of scholarship appropriations among schools would be based on the number of students from low-income families rather than on total enrollment, and the scholarship limit would be raised to $3000. Scholarships for students of optometry, pharmacy, podiatry, and veterinary medicine would be at the discretion of the Secretary of HEW, rather than mandated by law. To replace health professions loans, Title IV of the Higher Education Act of 1965 would be amended to include health professions students in the Federal Guaranteed Student Loan Program. They would be allowed to borrow up to $5000 per year, and loans would be forgiven at the rate of $5000 per year for practice in a medically underserved area. Finally, the various construction programs would be consolidated in a single authority[15] and would provide not only direct federal assistance but also loan guarantees and interest subsidies.

As in 1963, Congress altered the administration proposal in several important respects. Perhaps most significant, it mandated a third round of enrollment increases and added several new forms of assistance to encourage expansion by schools of medicine, osteopathy, and dentistry. Although it varied the level of capitation awards by health profession, the act continued to support schools of optometry, pharmacy, podiatry, and veterinary medicine. It extended the student loan program, and it required full use of construction grant assistance before any significant use could be made of loan guarantees or interest subsidies.

Capitation

Capitation—payment of a per capita sum to each medical school—was designed to replace the financial distress program. It used the concept of formula awards first incorporated in the basic improvement grants program. Schools of medicine, osteopathy, dentistry, optometry, podiatry, pharmacy, and veterinary medicine are eligible for capitation awards under the 1971 act. Awards may be used for the

[14] House of Representatives, Subcommittee on Public Health and Environment, *Hearings 1971* (Serial 92-10), p. 450.

[15] There were at the time five authorities: health professions teaching facilities, nurse training facilities, allied health teaching facilities, medical library facilities, and health research facilities.

general support of educational programs, including the costs of research and patient care essential to teaching and necessary alterations and renovations. Bonuses are provided by the formula for major enrollment increases and shortening of the length of time required to receive a degree.

A capitation grant requires expanding first-year enrollment in the 1972–73 school year by 10 percent over 1970–71, if enrollment is less than 100 students; otherwise by ten students or 5 percent, whichever is larger.[16] In addition, the school must assure that expenditures from nonfederal sources for its teaching program will equal the average amount expended from such sources during the three years preceding the grant. If the enrollment increase cannot be implemented without lowering the quality of training provided, the Secretary of HEW may waive the enrollment increase after consultation with the National Advisory Council on Health Professions Education. In the first year of capitation (FY 1972), 12 medical schools applied for a waiver, but no waivers were granted.[17]

Unlike the earlier basic improvement program, the level of capitation grants varied among the health professions. For each full-time student enrolled in the first, second, or third year of a medical program requiring more than three years, the award is $4000. To encourage shortening of the curriculum, for each graduate of a program leading to the M.D. degree after three years, and for each graduate of a six-year program that starts after high school, the award is $6000. Thus the total award for a student graduating from a three-year medical school is $13,500; for a student graduating from a four-year school it is $11,500.[18]

A first-year class may be designated a bonus class and earn the school additional funds. To qualify, a school must have 5 percent or five more students than it had in the first-year class the previous fall. (The first class eligible for the bonus is the class that entered in the fall of 1971.) This increase must be maintained and must be in addition to the expansion mandated by the capitation program. Once established, the enrollment bonus ($1000 per student) applies to all students in the class and continues until the bonus class graduates. However, no school may receive more than $150,000 for each bonus class in any given year.

These formulae are based on the entitlements authorized by the 1971 act. If sufficient monies to pay the authorized amount are not appropriated, then awards to each school are reduced proportionately. For FY 1972, medical schools received approximately 70 percent of the authorized grant level; and for FY 1973, they received 65 percent.

New Programs to Encourage Enrollment Expansion

Under the 1971 act, new schools of medicine, osteopathy, or dentistry are eligible for start-up assistance during the year preceding the first year in which the class is accepted, and for the following three years.

Only schools that began instruction after November 18, 1971, are eligible for this program. The maximum amount of the first-year grant is $10,000 times the number

[16] The structure of this provision disappointed a number of the schools that had participated in the Physician Augmentation Program. They had agreed to participate after being assured that enrollment increases for PAP would count toward any future mandatory enrollment expansion.

[17] Despite the denial of waivers, all eligible medical schools have participated in the capitation program. This is not true of the other health professions. Two dental schools and two schools of veterinary medicine that were denied waivers for FY 1972 declined to participate in the program.

[18] In addition, schools of medicine with fewer than 50 first-year students receive a base grant of $50,000 for a period of two years. Schools of medicine are also eligible for $1000 for each physician assistant enrolled in training as a full-time student.

of students the school estimates it will enroll the following year. For succeeding years the maximum amount is the number of full-time students enrolled times $7500 for the first year, $5000 for the second year, and $2500 for the third year. The funds may be used for any costs attributable to operation or establishment of the school except construction.

The 1971 act also authorizes a program of conversion assistance. A two-year medical school converting to a degree program and enrolling a third-year class before June 30, 1975, is eligible for a one-time grant of $50,000 for each student enrolled in its first third-year class.

Financial Distress

With the introduction of capitation, the 1971 act provides only limited authorizations for financial distress grants, which are removed from the special projects authority and placed in a separate section of the law, with declining levels of authorized expenditure: $20 million in FY 1972, $15 million in FY 1973, and $10 million in FY 1974. In administering the program, HEW has significantly changed the eligibility criteria. For applications not related to accreditation needs, expenditures are allowed under the grant only to meet current or accumulated operating deficits. Because financial distress grants under the old special project authority were forward funded, schools receiving the grants in FY 1971 were unlikely to have an operating deficit in FY 1972. Moreover, state-owned schools, as well as some private schools, are not permitted to run an operating deficit and thus cannot apply for aid under this program. These factors help explain why only 11 schools of medicine and osteopathy applied for financial distress grants in FY 1972, whereas 62 special project grants were made to schools of medicine for financial need in FY 1971.

A school receiving a financial distress grant must assure that in carrying out its functions it will expend an amount from nonfederal sources at least as great as the average amount expended during the previous three years. It must also agree to disclose any financial information relevant to the causes of financial distress and conduct a comprehensive cost analysis of all of its operations, including research and patient care. The school must further agree to carry out any operational and financial reforms required to eliminate the deficit.

Special Projects

Because most funds under the 1968 act were used for financial distress, special project grants were limited to increasing enrollment and shortening the period of training. The 1971 act continues authority for awards in these two areas and adds a number of new purposes for which special projects may be funded, without establishing priorities. HEW designated seven areas for priority in awarding special project funds during FY 1972, when most commitments were made:

Increases in total enrollment.
Increases in enrollment from among minority or low-income groups as well as from among those who may practice in rural or other shortage areas.
Reduction of length of time required for training.
Interdisciplinary training programs especially oriented toward the team approach to the delivery of health services.

Training in family medicine with emphasis on preceptorships.[19]

Training programs for new roles, types, and levels of health personnel with emphasis on physician assistants and dental therapists.

Training in the science of clinical pharmacology in schools of medicine and osteopathy.

Allowable expenses include salaries of professional and support staff, supplies, equipment, alterations, renovations, and the proportion of central resources and library support attributable to the project.

Loans and Scholarships

The 1971 act increases the maximum payable under the loan and scholarship programs to $3500 per year. It changes the loan forgiveness provision to 85 percent for three years' practice in a shortage area. Perhaps more significant, while retaining the earlier enrollment-based formula for allocating scholarship funds, it adds an alternative formula based on the number of students from low-income backgrounds. For FY 1973 and FY 1974 it authorizes schools to apply for scholarship monies using the larger of the enrollment formula (now increased to $3000 times one-tenth the number of full-time students), or a low-income formula ($3000 times the number of students from low-income backgrounds). The criteria used to determine the students who qualify as "low-income" depend on the financial situation of the students' parents and differ by family size. Available scholarship funds are prorated among the schools based on their entitlements. Loan funds are prorated among the schools based on their requests for assistance.

Construction Assistance

The 1971 act increases the maximum share of construction costs payable by a federal grant to 80 percent in the case of a new school, a major expansion, an increase of student enrollment, or other unusual circumstances. Otherwise, the federal share is increased to a maximum of 70 percent. As proposed by the Nixon Administration, the act authorizes construction loan guarantees to nonprofit private schools and interest subsidies to reduce the cost of such loans by up to 3 percentage points per year. However, the act stipulates that unless total appropriated grant funds have been obligated, guaranteed and subsidized loans may not exceed obligations under the grant program. The effect of this provision is to limit use of the loan guarantee and interest subsidy until grant funds have been expended.

Like the 1968 act, the 1971 act requires existing schools to increase enrollment in order to receive a construction grant.[20] In the past, HEW tied the actual federal share awarded to the size of the increase promised. With the passage of the 1971 act, HEW incorporated the size of enrollment increase as one factor in a 16-variable index used to evaluate grant applications and decide which would receive funds. The choice of variables and their weights was based in part on expressed Congressional intent. This index gives most weight to the size of the enrollment increase, the cost

[19] In a preceptorship, a student works under the supervision of a practicing physician.

[20] The minimum increase required remains 5 percent or five students, whichever is greater, over the highest first-year enrollment in the five years preceding the application. This increase is in addition to any required by formula grant programs (e.g., capitation). As is true of the capitation increases, the Secretary of HEW may waive this provision of the law.

of the project and its role in stabilizing an institution in precarious circumstances, the institution's ability to provide operating funds, and the effectiveness of the proposed space utilization.

New Training Programs

The 1971 act authorizes three new programs to support medical training: grants to public and private nonprofit hospitals for training programs in family medicine, grants to the health professions schools to support advanced teacher training, and a program of Health Manpower Education Initiative Awards. The last, a principal request of the Nixon Administration, authorizes awards for a broad variety of purposes. This authority is being used to launch a series of Area Health Education Centers, which are developed by a school of medicine or osteopathy but are deliberately located at a public or nonprofit hospital some distance from the school. The focus of the program is medical education, including continuing education for physicians.

NEW LEGISLATION

The Comprehensive Health Manpower Training Act of 1971 expires on 30 June 1974. The debate on successor legislation has just begun, and at this writing no bill has been submitted to Congress. Nonetheless, the President's health message indicates the likely features of the forthcoming proposal.[21] First, the message notes the considerable expansion of physician training that has taken place in the last decade (see Section III) and contrasts the expansion in physician numbers with the continuing concern over physician distribution, especially the access to primary care. The message suggests that the total number of physicians may soon be adequate to meet the nation's health care needs—as measured by historic physician to population ratios—but that the location and advanced training of these physicians may not be responsive to the pattern of health care demands. Therefore, it proposes gradually replacing general institutional assistance with programs to channel funds through the students to the health professions schools. Presumably, the schools would respond to reductions in formula grant funding by raising tuition, and the federal government would finance this increase by expanding the scholarship and loan programs. In contrast to the present situation, scholarships would be tied to service commitments—practice "in programs or areas of national need."[22] At the same time, the maximum size of a federal loan would be increased. These changes would effectively ask the medical student to finance more of the cost of his education from his future earnings. To encourage direct actions by the schools in support of these objectives, the administration would offer targeted grants—for example to initiate or expand programs of training in primary care.

SUMMARY

Increasing enrollment in the nation's medical schools has been a principal objective of federal health professions support. Initially, construction grants were

[21] *Message from the President of the United States Transmitting Proposals for Improving Health*, House Document No. 93-217, 20 February 1974.

[22] Ibid., p. 5. Thus they would be similar to the new military and Public Health Service scholarships.

offered to enlarge existing facilities or build new schools (1963). To these were added formula grants for operating expenses, with eligibility conditioned on increasing enrollment (1965). A new round of required enrollment expansion has accompanied each renewal of the formula grant program (1968, 1971). Special project grants encouraged additional increases in class size, with the first awards to increase enrollment made in FY 1969.

Although a desire to increase physician manpower was the impetus for federal institutional assistance, legislation in support of this goal has consistently included most of the health professions. Efforts of the executive branch to limit the professions eligible for assistance have been notably unsuccessful. Most recently, the Nixon Administration was rebuffed by Congress when it sought to limit capitation awards to schools of medicine, osteopathy, and dentistry; to make scholarship assistance for the other health professions discretionary rather than mandatory; and to separate special project authorizations for medicine, osteopathy, and dentistry from authorizations for optometry, pharmacy, podiatry, and veterinary medicine.

In the early 1970s, concern of the federal government expanded beyond enrollment and focused on the financial distress grant program. Awards for financial need were first authorized by the 1965 amendments to the HPEA Act (as part of special projects grants), and quickly grew in number until more than half the nation's medical schools were receiving assistance for "financial distress." To change the role of the federal government from "last dollar" to "first dollar" financier, the 1971 act offered much more generous support under the capitation program than had earlier formula grants. Because the intention was to replace distress grants with capitation support, the 1971 act limited authorizations for financial need awards. By setting much more stringent conditions for a grant, HEW sharply reduced the number of awards in FY 1972.

Besides shifting the bulk of federal institutional support from financial distress to capitation grants, the 1971 act emphasized a federal interest in educational innovation. Schools applying for capitation awards were required to submit plans for efforts in three of nine areas, most of them concerned with curriculum improvement or special programs of health care training. Special project grant awards were authorized for a variety of new purposes, and funding was provided for several new types of manpower training.

The debate on a successor to the 1971 act is just now beginning. The shape of the administration proposal is suggested by the President's health message: a change in emphasis from increasing the numbers of physicians trained to increasing the numbers of particular types of physicians. This would be accomplished by a gradual shift from general federal funding of educational costs to increased reliance on the tuition mechanism, supported by an expanded federal scholarship and loan program, with scholarships tied to service commitments, providing students with stronger incentives to seek particular types of medical careers. To encourage institutional change in support of these goals, the administration would likewise expand its use of the targeted grant.

III. ENROLLMENT EXPANSION

Federal policy appears to have achieved its greatest success in the simple objective of expanding medical school enrollment (see Table 1). Between academic years 1950–1951 and 1965–1966, first-year enrollment of medical schools grew by 22 percent or an average rate of only 1.3 percent per year. In contrast, first-year places since 1965–1966 (the first year of federal formula grants for enrollment expansion) have grown by 54 percent or a yearly average rate of 6.6 percent per year. The largest percentage change in a single year was in 1972–1973, the first year that all schools were required to increase enrollment as a condition of obtaining capitation grants.

It is hardly surprising that the medical schools responded to the strong incentives for expansion provided by the Comprehensive Health Manpower Training Act of 1971. The act provided payments of up to $2500 per student in each of the first three years of medical school and up to $4000 per graduate (actual payments were about 70 percent of authorized levels) for each school that increased the size of its entering class between 1970–1971 and 1972–1973 by ten students or 5 percent,

Table 1

GROWTH IN U.S. MEDICAL SCHOOL ENROLLMENT
1931-1978

Academic Year	Number of Schools	First Year Enrollment	Graduates
1930-1931	76	6,456	4,735
1940-1941	77	5,837	5,275
1950-1951	79	7,177	6,135
1955-1956	82	7,686	6,845
1960-1961	86	8,298	6,994
1965-1966	88	8,759	7,574
1967-1968	94	9,479	7,973
1969-1970	101	10,401	8,367
1970-1971	103	11,348	8,974
1971-1972	108	12,361	9,551
1972-1973	112	13,726	10,391
1973-1974	114	13,790	10,930[b]
1975-1976	114	14,820[a]	13,220[b]
1977-1978	114	15,541[a]	13,810[b]

SOURCE: "Medical Education in the United States 1972-1973," *Journal of the American Medical Association*, Vol. 226, No. 8, November 19, 1973.

[a]Projection in source.

[b]Projections of authors using aggregate data on withdrawals and transfers for most recent four years.

whichever was greater.[1] The act permitted the Secretary of Health, Education and Welfare to waive the mandatory enrollment increase when it could not be accomplished "because of limitations of physical facilities available to the school for training or ... without lowering the quality of training provided therein."[2] However, these provisions of the act were interpreted very narrowly, and no waivers for enrollment expansion were granted for the first year of capitation support. The underlying assumption of the HEW administrators—and perhaps Congress—seemed to be that there was room for 10 to 15 more students in every medical school first-year class. Bonus payments were made to schools that exceeded the mandated enrollment increase.

IMPORTANCE OF FEDERAL PROGRAMS

It is reasonable to judge a policy successful when the federal government gets the results it seeks. However, it would be inaccurate to conclude that the government alone was responsible for getting the nation's medical schools to expand their enrollment. In 1968, both the American Medical Association and the Association of American Medical Colleges jointly issued statements calling for "substantial increase in the enrollment of existing U.S. medical schools."[3] Concerned with an insufficient supply of physicians, a number of state legislatures called for expansion in their state school enrollments and for the construction of new medical schools within their state university systems. Nevertheless, the evidence suggests that without the powerful incentives of the capitation program, expansion would have been uneven and uncertain.

It is difficult to assess the importance of federal programs relative to other forces in much of the enrollment expansion that occurred in medical schools in 1968 and subsequent years, but we can infer a lower limit on the enrollment expansion attributable to federal forces. Between 1967–1968 and 1970–1971, 23 of the 89 fully accredited schools expanded their first year class size by 5 percent or less.[4] They had an aggregate enrollment growth rate of less than 1 percent per year over the three-year period—that is, less than the meager growth rate of the whole medical education system during the decade and a half before 1965. Only eight of these 23 schools participated in special project grants for enrollment expansion before the start of capitation grants, and their participation did not occur until after it seemed pretty clear from the policy debate that substantial federal institutional support would be made contingent on enrollment expansion.[5] All 23 schools participated in the capitation program and increased their first year class sizes by an average of 14 percent between 1970–1971 (the base year for the capitation grants) and 1972–1973 (the first academic year for which capitation payments were made). The earlier resistance of these schools to expansion establishes a *prima facie* case that the strong federal program thrust was finally responsible for their decisions to increase class size in 1971 and 1972.

[1] To encourage shortening of medical school curricula, the act provided up to $6000 per graduate of a three year M.D. training program or a program that was structured to award the M.D. degree with six years of education after high school.

[2] *Public Health Service Act*, Title VII, Part E, Section 770.

[3] *The Journal of the American Medical Association* (JAMA), Vol. 206, No. 9, November 25, 1968, p. 1990.

[4] *JAMA*, Education Numbers, 1968, 1971, 1973.

[5] Unpublished data from the National Institutes of Health, Bureau of Health Manpower Education.

The capitation grant program was most surely responsible for expansion of a different sort in 1972-1973. The great majority of the schools—all but the 23 discussed above—had expanded enrollment to a greater or lesser extent before capitation grants, many at the instigation of the federal government. Several of these felt that they had already reached their "full capacity," and they planned to stabilize their class size at levels reached before 1972–1973. As a group, they viewed as unfair the capitation formula that took no account either of past growth or of factors related to capacity. Ultimately, all these schools participated in the 1972–1973 capitation program and accepted the mandated enrollment increase. However, there is little doubt that some in this group would not have undertaken a final expansion in the absence of the strong "all or nothing" financial incentives of the capitation program.

DIFFERENCES IN STATE AND PRIVATE SCHOOL RESPONSE

Although federal legislation has made no distinctions between private and public (state) medical schools, the different admissions policies of the two groups suggest we pay some attention to the differential effects of federally sponsored enrollment expansion programs.[6] For the 89 fully accredited medical schools and basic medical science schools (two-year schools) in operation during 1967–1968, federal programs do not appear to affect public and private school enrollment growth differently. Over the five-year period between 1967–1968 and 1972–1973, total enrollment in the public schools increased by 36 percent and in the private schools by 35 percent. In the 23 schools that initially resisted enrollment expansion, both public and private schools were represented in proportion to their numbers in the whole population of schools.

Although existing public and private schools responded equally to enrollment expansion incentives, the situation was quite different with regard to federal programs designed to stimulate the development of new medical schools. Fifteen new medical schools have been accredited since 1967–1968. Eight more new schools admitted students and were in various stages of development in 1972–1973.[7] Only five of these 23 schools were private. Furthermore, all of the private schools had either been planned before 1963, when federal programs offered specific incentives for new school development, or were built around large medical centers with well-established graduate medical education programs.

Federal funds, together with state funds, caused a proliferation of new public schools, but federal assistance for new schools appears not to have been sufficient to start any private medical school purely from scratch. The one-sided nature of this growth has some important implications for the individual's access to medical education.

CHOICES AND CONSTRAINTS IN FURTHER ENROLLMENT EXPANSION

There is considerable debate regarding the need for further expansion of the capacity to educate physicians in this country. The program decisions that emerge

[6] See Section IV, pp. 24-31, for a discussion of admissions policies.

[7] *JAMA*, Vol. 226, No. 8, November 19, 1973.

from the policy debate in the months ahead will provide an implicit answer to the question of whether there is a need for additional medical school places. The program decisions in the areas should be consistent with decisions in related spheres—in particular, immigration of foreign-trained physicians, the scope and type of coverage to be provided by national health insurance, and the evolving places of allied health professions in the health care delivery system.

We do not address the issue of whether more medical school places are needed, because research on which this report is based has not addressed the central problems of estimating the demand for physician services. Rather, we are concerned with the choices the federal government has in expanding medical school enrollment and the constraints to attaining expansion that the government and the existing or prospective medical schools would face should increased enrollment seem desirable.

A decade ago, medical school administrators might have argued that there was an insufficient number of qualified applicants to support substantial expansion in medical school enrollment. It is difficult to assess the merit of that argument retrospectively. In any case, we know of no dean of admissions who would make that argument about today's medical school applicant pool. Instead most feel that they are forced to reject many "qualified" applicants.[8] This view is consistent with the fact that medical schools have been able to train and graduate minority candidates who are, by conventional standards, less well qualified than many of the nonminority applicants they reject.[9]

Although there are good reasons to believe that the national pool of rejected qualified applicants is large enough to support considerable enrollment expansion beyond what has already occurred or is programmed, this may not be the case of the applicant pool a particular school is constrained to consider. Some state supported medical schools have difficulty finding enough well-qualified resident applicants to meet the explicit or implicit quotas set by their state legislatures. The same is true of some medical schools seeking more minority representation in their entering classes.

Further enrollment expansion would be constrained by operating budget and capital budget in a number of medical schools. However, the experience of the recent past suggests that these are precisely the constraints that the federal government has power to remove. Although it would appear counter to the administration's policy, there can be little doubt that the federal government could buy more enrollment by using construction grants to build more space. Many schools would probably be willing to expand enrollment further in return for substantial operating budget support.

There is one important constraint that the federal government has little power to remove—the supply of teaching patients. There is no absolute requirement for teaching patients or teaching beds per student. However, both medical educators and medical students seem to have a pretty clear sense of when their exposure to patients is inadequate for educational purposes.[10]

A number of factors influence the supply of teaching patients, the most straightforward being population density in the area where the medical center is located. Figure 1 shows the distribution of medical schools according to the ratio of popula-

[8] It is not clear what proportion of these qualified applicants the medical school education system, as a whole, rejects. Since potential students apply to several schools and since admissions criteria differ from school to school, the prospects for the rejected applicant are likely not as bleak as the individual admissions dean perceives.

[9] The characteristics of the applicant pool and the admissions process are discussed in Section IV.

[10] The financial aspects of providing adequate numbers of teaching patients are discussed in Section VII.

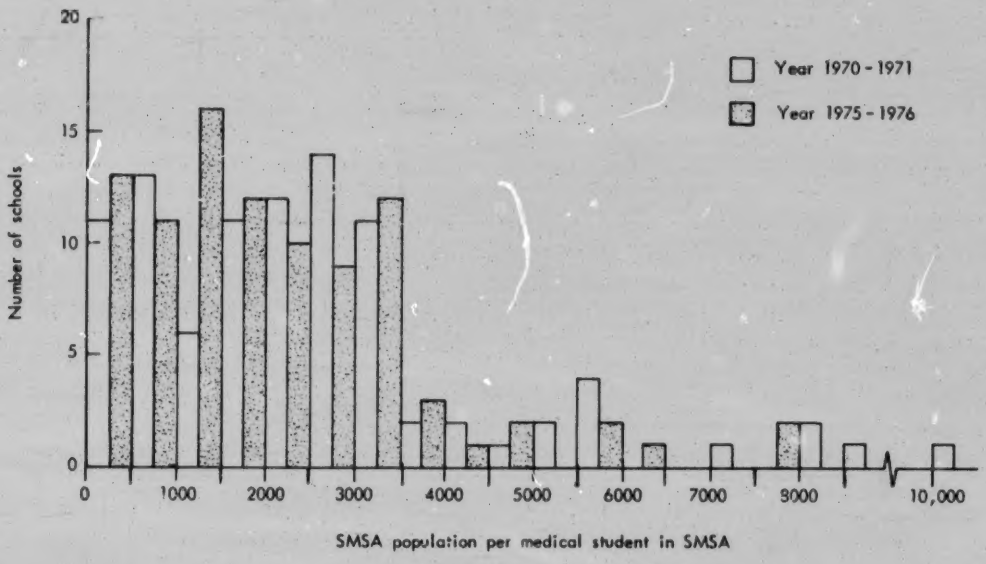

Fig. 1—Distribution of medical schools by ratio of population to students

tion in each Bureau of the Census Standard Metropolitan Statistical area (SMSA) to the total number of medical students in all schools in that area.[11] The 1971–1972 total enrollment data and the 1970 census data have a mean ratio of SMSA population to medical students of 2532, but a small number of schools have high ratios. To show the effect of enrollment expansion, we have projected annual population growth of 1.3 percent in SMSAs and the enrollment expansion mandated by the Comprehensive Health Manpower Training Act to estimate the changes that will occur by 1975.[12] This distribution is superimposed on the 1971–1972 distribution in Figure 1.

There are no objective criteria for determining when a medical school's teaching facilities become population constrained. However, we are able to observe relationships between the teaching patient base of a school and its financial position. In our analysis of financial distress awards (see Section VIII), we found a statistically significant negative relationship between the institutional deficit and the ratio of SMSA population to medical students. In our detailed study of ten schools, tangible evidence of the importance attached to the teaching patient base was provided in the form of a willingness to spend scarce institutional budget resources to enlist and upgrade the staff of teaching hospitals in outlying areas.[13]

[11] The SMSA is less than a perfect measure of the population base for an academic health center. Perhaps the most important deficiency is that the SMSA boundaries exclude outlying towns and rural areas, even though their populations may turn to the health care facilities of the SMSA for primary as well as secondary and tertiary care.

[12] The enrollment figures were obtained by multiplying 1972–1973 enrollment figures for first-year students by four. The population growth rate projection is the average rate of growth in metropolitan areas from 1960 to 1970.

[13] From our limited information, it appears that the teaching patient population problem becomes of sufficient importance to merit unusual expenditure of school resources for population to student ratios between 500 and 1000.

The importance of a nearby large population base to a medical school depends in some measure on the thrust of its teaching program. If the medical school is content to conduct its clinical teaching programs almost solely in the secondary and tertiary care setting of a large referral hospital, there is no *a priori* reason why the school cannot be located in a small city of, say, 20,000.[14] This would be the case if the reputation of the medical center and the unavailability of comparable care in nearby areas insure an adequate supply of referral patients. However, the more a medical school emphasizes training in primary care and ambulatory care, the more binding will be the population constraint.

Medical schools that face no inherent local population constraint may encounter difficulty in getting an adequate supply of teaching patients for other reasons, the two most common being an excess supply of hospital beds and a high ratio of physicians to population. Competition between hospitals for in-patients in an "over-bedded" area causes some hospitals to refrain from involvement with undergraduate medical education because they feel that private patients prefer a setting without medical students. In an "over-doctored" area, local physicians are likely to favor the same real or perceived patient preferences by sending their private patients to nonteaching hospitals. An added factor here is the local physicians' concern about losing patients hospitalized in major teaching hospitals to the full-time medical school faculty. The ambulatory care facility operated by a medical school is directly competitive with the local physician and thus is likely to exacerbate problems in an over-doctored area. The town-gown problems that stem from economic realities may be difficult to resolve satisfactorily for some medical schools.

The federal government can intervene to mitigate some of the problems of limited teaching patient population. The Area Health Education Center (AHEC) is an example of a program that can increase the effective supply of teaching patients while extending benefits of academic medicine to populations beyond the immediate locale of the medical center.[15] Another concept, the "medical school without walls," relies for clinical instruction on a substantial number of small private hospitals instead of two or three large hospitals.[16] These are pilot programs, but it seems likely that federal funds can substantially influence the likelihood of their success and extension.

SUMMARY

The federal government was able to obtain the enrollment expansion it sought in 1971 seemingly by using the simple policy instrument of capitation. However, other programs, such as construction grants, were also important in facilitating expansion, and it would be incorrect to assume that the burden of the mandated expansion was equalized across schools.

[14] An example of such a center is the Dartmouth Medical School with the Mary Hitchcock Memorial Hospital and the White River Junction V.A. Hospital.

[15] The AHEC program is still in the early stages of implementation. Our limited observations suggest that the concept is clearly viable from the standpoint of third-year medical student clinical rotations and for at least limited clinical elective courses. However, our view may be biased by observations of hospitals that had well-established graduate programs before AHEC.

[16] None of the ten schools in our sample refers to itself as a medical school without walls, although several use a large number of teaching hospitals to supplement the facilities of one or two major teaching hospitals. Although the patient mix and faculty resources that these hospitals offer vary widely, we know of no analysis of the effects on students, and available test instruments are not well suited to such evaluation. We have observed that the management burden on the medical school is increased substantially with the proliferation of teaching facilities.

The administration is not proposing to use federal funds to expand medical school enrollment further, but the issue of expansion is likely to arise in Congress in 1974, as it did in 1971. Should it choose to do so, the federal government still appears to have substantial latitude to increase enrollment by the selective use of program incentives. Although there is substantial room for expansion in the whole medical education system, some academic health centers would encounter severe constraints if forced to increase enrollment much above present levels.

Some factors that might theoretically constrain growth do not appear to present problems at this time, and other existing constraints can readily be removed by government action. The high quality of the national applicant pool would almost certainly assure sufficient qualified applicants for moderate enrollment increases in all schools. Some schools are operating at or near the capacity of their existing physical facilities while others have room to grow, but this problem can be alleviated by federal construction aid.[17] The requirement for operating budget resources could presumably be met from the revenue generated by the tuition payments of the additional students and federal incentive grants.[18]

The most rigid constraint a center is likely to face is the supply of teaching patients. The importance of this constraint and when it comes into force are largely determined by the nature of a center's programs and the circumstances of its environment. The costs of developing sound teaching programs in previously nonaffiliated hospitals appear to be high. However, federal programs such as the Area Health Education Centers show promise for easing both the demographic and budget constraints of teaching patient supply.[19]

[17] To the extent that enrollment expansion is accomplished by building new medical schools, the record of the past suggests that these are likely to be public rather than private schools. However, our analysis has not dealt directly with the problems of establishing new centers.

[18] Our analysis of department growth in Section VIII suggests that the marginal operating costs of additional students are lower than average costs.

[19] At present, price control regulations make it difficult for a nonteaching hospital to shift its accounting system to incorporate "educational" costs. This problem and its implications are discussed at more length in Section VII.

IV. STUDENT ADMISSIONS

As a new physician passes through medical school and postgraduate training he crosses two or three major formal barriers that could be classed "admissions processes." Admission to medical school, when measured by the yardstick of the ratio of applicants to places, is usually the most stringent test the prospective physician will pass. Thereafter, selection of an internship and of a residency training program may both involve competition against a number of other candidates as well. These choices have important effects on the career path the physician will be able to follow. We will briefly discuss the progress of intern and resident selection in Section V. Here our concern is with admission to the undergraduate M.D. program. The analysis that follows is, of course, quite preliminary. Much checking of statistical models remains to be done. However, it seems unlikely that any of the conclusions would be changed in broad outline.

THE APPLICANT POOL AND THE ACCEPTED CLASSES

The total pool of applicants to medical school has grown rapidly since the early 1960s. As Tables 2 and 3 show, the most striking growth occurred between 1970–71 and 1972–73. In this period the size of the college-graduating cohort grew by about 8 percent while the proportion of the cohort seeking admission to medical school rose by 33 percent. We can only speculate on the reasons for the recent rise in the ratio of medical school applicants to undergraduate degrees: It may be related to the declining attractiveness of nonmedical scientific careers as well as to perceptions of the rewards offered by a medical career.

Table 2

APPLICANTS AND ADMISSIONS TO U.S. MEDICAL SCHOOLS

First Year Class	Applicants	Accepted Applicants	First Year Enrollment
1955-56	14,937	7,969	7,686
1960-61	14,397	8,550	8,298
1965-66	18,703	9,012	8,759
1970-71	24,987	11,500	11,348
1972-73	36,135	13,757	13,726

SOURCE: *JAMA*, Vol. 226, No. 8, November 19, 1973, p. 909.

Even with the projected increase in first year places in medical schools (see above, p. 14), the ratio of applicants to medical school places is not likely to return to the levels of the early 1960s. Table 4 shows a rough projection to 1976–77 based on estimates of the number of bachelor's and first degrees granted and the propor-

Table 3

BACHELOR'S AND FIRST PROFESSIONAL DEGREES AND MEDICAL SCHOOL APPLICANTS

Year	Degree Recipients[a]	Medical School Applicants[b]	Ratio Applicants/ Degrees
1955-56	287,401	14,937	.0520
1960-61	394,889	14,397	.0364
1965-66	538,930	18,703	.0347
1970-71	833,322	24,987	.030
1972-73	903,000	36,135	.040
1976-77 (projected)	1,100,000	33,000-44,000	

SOURCE: *JAMA*, Vol. 226, No. 8, November 19, 1973, p. 909; and American Council on Education, *A Fact Book on Higher Education*, Fourth Issue, 1972, p. 72.189.

[a]"Degree recipients" are those who received a bachelor's or first professional degree in the preceding academic year.

[b]Some medical school applicants are in their junior year of college; others may have graduated in previous years. Therefore, the degree-recipient cohort shown here does not precisely measure the group from which the medical school applications are drawn.

Table 4

APPLICANTS PER MEDICAL SCHOOL PLACE

Year	Applicants per Place
1955-56	1.94
1960-61	1.73
1965-66	2.14
1970-71	2.20
1972-73	2.63
1976-77 (projected)	2.14-2.85

SOURCE: Tables 1 and 2 and *JAMA*, Vol. 226, No. 8, November 19, 1973, p. 909.

tion that might be expected to apply to medical school. If the applicant/degree ratio declined even to the level of 1970 (.030), the ratio of applicants to places in first-year classes would still remain above 2.14:1.[1] Thus, medical schools will continue to enjoy the luxury of being able to take the cream of the applicant pool, and a shortage of qualified applicants is unlikely to be a constraint on school expansion.

It is hard to measure just how the pool of medical school applicants would rank in the total college-graduate population. The Medical College Admissions Test (MCAT) provides no guide because the scores are standardized on medical school applicants to produce a mean of about 500 with a standard deviation of 100; it therefore does not compare applicants with nonapplicants in any way. College grades are a slightly more useful guide to the quality of the medical school applicants, since they do involve some measure of competition with nonapplicants. For the schools in our sample, the groups of applicants have group mean grade point averages between 2.85 and 3.10 on a 4 point scale. The groups of those who are accepted and matriculate in the sample schools have grade averages between 3.15 and 3.35. The average undergraduate GPA of entering medical students nationwide appears to be in the range 3.15–3.35; thus on this dimension our sample schools appear to be representative.[2] Grading standards vary across the country and change over time, but these averages do imply that the successful applicants to medical school are drawn from the top 15 percent or so of their graduating classes. The schools from which the matriculants come are also generally more competitive than the average in admissions.[3]

THE PROCESS OF STUDENT SELECTION

Most medical schools have between 10 and 30 applicants for each position in the entering class. Sifting through several thousand applicants to choose 200 or so is a costly operation. At most schools the selection process involves reading applications, reviewing letters of recommendation, and interviewing a number of candidates who pass the initial screening. The cost to the medical school is substantial; in a study of admissions at four medical schools, Rosenberg estimated that costs ranged from $544 to $1775 per accepted student if a value was imputed to the time used in interviewing and added to the visible direct costs.[4] Applicants, in turn, may spend several hundred dollars on travel and application fees.[5] The commitment of such substantial resources is evidence of how seriously the schools take the problem of selecting the prospective class.

[1] Census Bureau projections estimate that the 18–21 year age group will continue to grow, although slowly, until the late 1970s. See American Council on Education, *A Fact Book on Higher Education*, Second Issue, 1972, p. 72.63. The above projection assumes that there will not be a major shift to nonmedical careers in biological science, a safe assumption unless federal science policy is sharply reversed.

[2] *JAMA*, Vol. 226, No. 8, November 19, 1973, p. 911.

[3] Grade point averages are computed from the data on applicants supplied to us by the American Medical College Admission Service (AMCAS). The measure of competitiveness of undergraduate schools is based on the evaluations of *Barron's Profiles of American Colleges*. We assigned a value of 9 to *Barron's* "Most Competitive" category, 7 to "Highly Competitive," 5 to "Very Competitive," and so on. Most schools in the country rank 3 or lower on this scale. The mean for the applicant groups at the sample medical schools ranges between 4.5 and 5.3. See *Barron's Profiles of American Colleges*, Barron's Educational Series, Inc., Woodbury, N.Y., 1972, pp. xxii-xxix.

[4] Mark L. Rosenberg, "Increasing the Efficiency of Medical School Admissions," *Journal of Medical Education*, Vol. 48, No. 8, August 1973, pp. 707-717.

[5] See Samuel Z. Goldhaber, "Medical School Admissions. A Raw Deal for the Applicants," *Science*, Vol. 77, July 28, 1972, pp. 332-334.

What are admissions committees seeking? No single answer can be given to this question. Criteria vary from school to school: Some schools emphasize the importance of producing medical scholars and researchers, others emphasize the production of providers of care. Committees themselves are not monolithic. In any admissions committee meeting one may discover that there are advocates for research, social activism, primary care, and any of the medical specialties. Admissions deans appear to have little confidence in their ability to predict specialty or career choice, however, so the outcome is likely to be a class with a variety of attributes representing a search for "balance" and the outcome of the committee advocacy process.[6]

Admissions committees must deal implicitly or explicitly with a balancing of two types of risks. If they emphasize academic preparation and aptitude at the cost of ignoring other qualities, they may overlook individuals who could make an important contribution to medicine or could be fine practitioners. If they emphasize nonacademic qualities, they may admit individuals who have difficulty with the curriculum. The balance struck between these two types of risks seems to vary from school to school in our sample. In one school, much of the cost of interviewing candidates is justified by references to a student who was admitted a few years ago on a dean's hunch and graduated first in his class. Other schools seem to go more by the tangible—especially numerical—attributes of the applicants.

The extent to which nonacademic considerations enter seems to be related in part to the presence on the admissions committee of students, representatives of the community, and other nontraditional members.[7] Whether this diversity in membership is the *cause* of greater willingness to sacrifice academic values or merely an effect of a more basic decision to change the emphasis of admissions cannot be determined from our observation. It is important not to underestimate the depth of commitment that faculty themselves may have to finding promising practitioners as well as future academic physicians.

STUDENT ADMISSION AND EQUALITY OF ACCESS

Considerations beyond those of academic background and promise as a physician also enter the decision. Some of these considerations flow from the policy interests of the state and federal governments.

Both state and federal governments have multiple objectives in their relations with the schools, and they apply pressures and provide incentives in numerous ways. Both are concerned with the dual nature of a medical school as supplier of capital goods to the health industry and as a gateway to a career providing high income, prestige, and social status. Federal policy has aimed at increasing the number of physicians, at eliminating barriers to entry based on sex and race, and at reducing the financial barriers to medical education. The number of places in medical schools has increased substantially. The expansion of state schools, and of state support for

[6] A good review of the admissions literature may be found in Harrison G. Gough, "The Recruitment and Selection of Medical Students," in Robert M. Coombs and Clark E. Vincent, eds., *Psychological Aspects of Medical Training*, Charles C. Thomas, Publisher, Springfield, Illinois, 1971, pp. 5-43. At several schools in our sample, faculty members are investigating relations between measures of student personality type and medical practice characteristics, and hope eventually to be able to select a crop of students that will more closely match society's health care needs. But stable predictive relations are hard to define and society's needs may be hard to foresee.

[7] Such extension of committee membership is one of the recommendations made in William D. Bradford, "Requirements for Admission to Medical School," in William G. Anlyan et al., *The Future of Medical Education*, Duke University Press, Durham, North Carolina, 1973, pp. 53-70.

private schools, however, has increased the importance of discrimination by residence. In exchange for what may be a small net flow of resources from state government to the schools, legislatures have insisted that admissions committees discriminate strongly against nonresident applicants.

The pressures from state and federal governments combine with the desires of the medical school faculty for a particular type of entering class and with the characteristics of the applicant pool to determine admissions outcomes. To assess the relative importance of the various considerations, we have gathered data from ten schools and estimated for each of the schools statistical functions describing the probability of acceptance to medical school as a function of academic background, performance on the MCAT, quality of undergraduate school attended, residence, sex, race, and other personal attributes. Table 5 presents three such functions for one of the schools in our sample.

Data for the entering class of 1972 were provided by the American Medical College Admission Service (AMCAS), the central clearing-house for information on applicants and admissions decisions. AMCAS was created in 1970, and data for earlier periods are hard to find. The data on which the equations are based are drawn from one of the public schools in our sample of ten. This school, along with several others in our sample, maintained its own admissions records before the establishment of AMCAS, and the 1969 data are drawn from this admissions information system.

The coefficients shown in Table 5 can be interpreted as weights applied to the various characteristics of an applicant. Each applicant has a number of characteristics we can measure: undergraduate grade average, MCATs, and so on. In addition, each applicant has a number of characteristics we cannot measure easily: personal attractiveness, apparent commitment to a medical career, and the like. The decision of the admissions committee considers the measurable and nonmeasurable attributes, combines them, and produces a decision to admit or reject the candidate. Applicants' characteristics vary in complicated patterns; our statistical problem is to find a set of weights that can be applied to the measurable characteristics of all the applicants to predict as well as possible the actual decisions made by the committee.

If we look down the first column of Table 5, for example, it tells us that in order to estimate the probability that a particular applicant would be accepted we should calculate 2.66 $\times$ (the applicant's science GPA) + 2.02 $\times$ (the applicant's nonscience GPA) + . . . , and so on. To change this long sum into a probability, we calculate the transformation

$$\frac{1}{1 + e^{-(\text{the sum})}}.$$

The resulting figure is the probability that such an applicant would be accepted.

The characteristics of applicants that we cannot measure, together with random influences alleged to be significant, such as the "mood" of the committee, will affect admissions decisions in ways that may be important. Thus, our predictions based solely on the measurable characteristics of applicants will be less than perfect.

The summary statistics below the coefficients measure how well the equation predicts admission decisions. The Chi-square, which can be interpreted just like the Chi-square of an ordinary contingency table, tests the hypothesis that there is no relation between the explanatory variables and the probability of acceptance, the dependent variable. The Chi-squares shown here are all large, indicating as shown below them that the probability that there is in fact no such relation is very low (considerably less than 0.0001). The equations predict well.

Table 5

LOGIT EQUATION COEFFICIENTS FOR MEDICAL SCHOOL ADMISSION, A TYPICAL PUBLIC SCHOOL

Variable	1969 Total	1972 Nonminorities	1972 Minorities
Science GPA	2.66***	3.47***	1.14**
Nonscience GPA	2.02***	.409	.378
Science hours	.00112	.00706	.0282**
Grade trend	.369	-.0935	-.644
Verbal MCAT	.00554**	.00534**	.00121
Quantitative MCAT	.00612**	.00374	.00191
General information MCAT	.00403	.00153	-.00087
Science MCAT	-.00635**	-.000413	.00688*
Selectivity index for undergraduate college	.506***	.220**	.171
Years older than 22	-.0432	-.408**	-.319**
Marital status	.262	.726	.184
Junior applicant	-.828*	-.235	-.084
Attended graduate school	.642	.564	-.952
Female	-1.44**	-.363	-.174
Resident	1.55***	.939**	-.171
Same undergraduate school	.954**	.452	-.171
Constant	-25.8	-23.8	-11.6
Chi-square	(231.5)	(153.4)	(62.9)
D.F.	(16)	(16)	(16)
Significance (p <)	(0.000)	(0.000)	(0.000)
N	466	818	172

*Denotes significance at .1.
**Denotes significance at .05.
***Denotes significance at .01.

Table 5 (continued)

Variable Definitions and Notes

Science GPA	Cumulative average grades in science and mathematics courses, standardized to A = 4.0.
Nonscience GPA	Standardized cumulative average in all nonscience academic courses.
Grade trend	Cumulative GPA minus freshman year GPA.
Verbal, quantitative, general information, and science MCAT	Scores on the four parts of the Medical College Admission Test. The MCAT is standardized approximately to a mean of 500 and standard deviation of 100.
Selectivity Index	A scale from 1 to 9 of the selectivity in admissions of the undergraduate college attended by the applicant. Taken from Barron's Profile of American Colleges.
Marital status through same undergraduate school	A set of dummy variables taking values of 1 if the applicant is a junior rather than a senior, has attended graduate school, is female, is a resident of the state in which the medical school is located, and attended the undergraduate college on the same campus as the medical school.

The estimation procedure is a maximum likelihood logit technique developed by Marc Nerlove, a Rand consultant at Northwestern University, and Kenneth Maurer of Rand. The probability of acceptance estimated from the equation can be calculated as:

$$\Pr(\text{acceptance}) = \frac{1}{1 + e^{-(a+b_1x_1+b_2x_2+\ldots+b_nx_n)}}$$

where a and b_i are the estimated constant and coefficients and the x_i are the independent variables.

Sample size is an important determinant of the cost of this estimation procedure. The equation for minorities is based on the total pool of minority applicants (N = 172). The 1969 total and 1972 nonminority equations are based on 25 percent random samples of the populations to which they apply.

In the equations shown, some of the explanatory variables are closely related to the admission outcome, and others appear not to be. This is denoted by the level of significance shown by the asterisks. The levels of significance denote the importance of the variable to which they apply in explaining or predicting the admission decision. For example, in the first column Science GPA is highly significant; being a female applicant is less significant; score on the General Information MCAT is not significant. Variables that are not statistically significant are not closely related to the admission decision and contribute little to our ability to predict it. Variables that are highly significant are closely related to the outcome and help prediction.

In Table 5 we have separated the minority applicants from the nonminority applicants in 1972. Our decision to divide the applicant pool into two parts on subpopulations reflects the fact that in the school from which these data are drawn, minority applicants are considered by a separate committee and selected by criteria

that are said to be different from those applied to nonminority applicants. Fitting an equation with the same independent variables to both groups tests the truth of the assertion that different considerations do apply to the two groups.

Specification of the models and choice of subpopulations rests on both previous literature and observation of the admissions process. There are numerous studies on both admissions outcomes and committee views of important considerations in student selection. These generally agree on the importance of science achievement as measured by undergraduate science grades and the science MCAT. In addition, some consideration is usually given to the quality of the undergraduate school attended by the applicant and to other measures of general intelligence, such as nonscience grades and the verbal and quantitative MCATs.[8] In most schools an interview is required for admission in addition to letters of recommendation. Admissions committees usually stress the importance of these data but agree uncomfortably that interviews are nonreproducible across interviewers, and letters from other than well-known colleagues are hard to interpret. Discrimination against candidates who are more than a few years older than 22 is based on the fear that those applicants are more likely to drop out of medical school and on the expectation that they will have shorter productive careers than younger candidates. All of these considerations are documented in the literature and in our interviews with committee members and admissions deans. In addition, we have spent some time observing admissions committee meetings in sample schools.

Division of the applicant pool into subgroups is based on the structure of committee responsibilities. In the school from which the equation presented here is drawn, decisions on minority-group candidates are delegated to a special subcommittee on which several minority-group faculty sit. The mandate of the subcommittee quite explicitly allows it to weigh measures of academic performance differently than does the general committee. That the subcommittee does in fact weigh such measures differently is reflected in the coefficients of the logit equations. In some of the other state schools, we had to separate applicants into residents and nonresidents because only very small proportions of the nonresidents (.1 percent or less) would be admitted, and including them affected the coefficients substantially.

Table 5 shows, as we would expect, that in the 1969 total and 1972 nonminority samples, scientific achievement as measured by science GPA and general academic background indicated by attendance at a highly selective undergraduate school are important considerations in admission. The test scores present a mixed picture: The verbal and quantitative MCATs are basically measures of general intelligence. The general information MCAT is a test of knowledge of current events, the arts, and society and is honored as indicating well-roundedness but is apparently ignored. The science MCAT correlates fairly highly with both the science GPA and the selectivity index; this correlation may account for the ambiguity of its effect here. The applicant's age has the expected negative effect on admission in the 1972 sample.[9]

Patterns of discrimination and nondiscrimination that are of policy interest are revealed in the three equations. For nonminorities, residence is an important consid-

[8] Cf. Ronald L. Hamberg et al., "Perceptions and Usage of Predictive Data for Medical School Admissions," *Journal of Medical Education*, Vol. 46, November 1971, pp. 959-963; and the classic volume Helen H. Gee and John Cowles, eds., *Appraisal of Applicants to Medical School*, Association of American Medical Colleges, Evanston, Illinois, 1957. See also Gough, "Recruitment and Selection of Medical Students."

[9] If we fit an equation with the same set of independent variables to a sample of 1972 applicants without considering minority status, the pattern of significant and insignificant coefficients is unchanged from the 1972 nonminorities; the coefficients are, of course, somewhat changed in magnitude. Thus, it seems unlikely that we need be concerned with any bias that might have been introduced into the 1969 equation by improper aggregation of minorities and nonminorities.

eration. Since the school shown here is a state institution, that result is not surprising.[10] Many "private" schools, however, also have arrangements for financial support from their state in exchange for giving special consideration to applicants from the state. For at least one such private school, fitting an admissions equation similar to these reveals an even more powerful state residence effect than we find in this public school. A significant change in policies on admission of women can be seen by comparing the 1969 and 1972 equations. The strong discrimination women faced in 1969 has been eliminated.

The equations in Table 5 refer to only one school. We have fitted the same equations to data from the other nine schools in our sample, and there are interesting contrasts across the schools that we will explore in further work on student admissions. However, the issue of concern here is equality of access. On this issue, the equations for the classes entering in 1972 from all of the schools are consistent.

1. At every school, minority applicants receive strong preference.
2. None of the schools discriminates against women; one discriminates mildly in favor of them.
3. Five of the six state schools discriminate in favor of state residents; two of the four private schools discriminate in favor of residents and one additional school favors applicants from a set of surrounding states as well as its home state.

Table 6 shows the increase in enrollments of minorities and women at *all* medical schools since 1969.

The differences between the minority and nonminority equations of Table 5 allow a comparison of the ways in which the two groups of applicants are evaluated. The insignificance of the verbal MCAT and the Selectivity Index probably reflects admissions committees' adaptation to the belief that general intelligence tests discriminate against minorities and the fact that minority applicants come, on average, from less demanding undergraduate schools. The insignificance of residence reflects the keen competition nationally for qualified minority students. In all the schools we have studied, some special and often fairly substantial effort has been directed toward locating such people and persuading them to enroll.

The logit equations shown in Table 5 provide a simple technique for evaluating the special consideration given minority candidates. If we have the values for MCATs, grades, and the other independent variables, we can substitute those values into the logit equation and estimate the probability that an applicant with those MCATs, grades, etc. would be admitted. We can, for example, consider a strong minority candidate, one whose scores all lie one-half standard deviation above the mean for minority applicants. Assume, also, that this hypothetical applicant is 22 years old, and is a nonresident, unmarried, and so forth so that all of the dummy variables take the value zero. The probability that such a candidate would be admitted if the minority equation is used to make the prediction is .53; by contrast, the probability that a candidate with the same characteristics would be admitted if the nonminority equation is used to make the prediction is .0047. Since the equations can be viewed as surrogates for the admissions *process*, the differences between these two probabilities indicate the importance of minority status. Table 7 shows these calculations together with the estimated probabilities for a candidate whose scores are one-half standard deviation above the nonminority mean and for whom all the dummies are equal to zero.

[10] Of the 7,521 first-year places in publicly owned medical schools in 1973–74, 6,676 (or 89 percent) were filled by state residents. By contrast, 2,997 (or 50 percent) of the 5,939 places in private schools were taken by residents. *JAMA*, Vol. 226, No. 8, November 1973, p. 911.

Table 6

ENROLLMENT OF WOMEN AND MINORITIES[a]
IN FIRST YEAR MEDICAL CLASSES

School Year	Women	% of Class	Minorities[b]	% of Class
1969-70	952	9.2	387	4.0
1972-73	2315	16.9	1086	6.7

SOURCE: *JAMA*, Vol. 226, No. 8, November 19, 1973, pp. 910 and 913.

[a]Minorities include Afro-American, Mexican American, American Indian, Puerto Rican (Mainland).

[b]Excludes Howard and Meharry, the two predominantly black medical schools.

Table 7

PROBABILITY OF ACCEPTANCE BY EQUATION AND CANDIDATE

	Equation	
	Minority	Nonminority
Minority candidate scores at minority mean + 1/2 s.d.	.53	.0047
Nonminority candidate scores at nonminority mean + 1/2 s.d.	.86	.057

These data refer to only one school and to one year. In all of the other schools in our sample, however, special minority recruitment programs seek out qualified candidates. All of the medical schools seem to be making similarly substantial efforts to adapt to the different characteristics of the minority applicant pool.

How important is discrimination by state residence? We can look at this question in much the same way as we have examined the importance of minority status. There are 10 schools in our sample of which six are state schools and four are private; the weight given state residence varies across these schools as follows:

1. At two schools—one state, one private—the admissions equation shows that residence is irrelevant. The coefficient on the residence variable does not differ significantly from zero.
2. At two schools—one state, one private—there are regional arrangements and preferences that affect admissions to some degree but are hard to characterize simply.
3. At three schools—one state, two private—residence is an important though not overriding consideration. We can estimate the importance of residence in these cases by calculating the probability that a candidate with specified characteris-

tics would be admitted if he were a resident and if he were a nonresident. Considering candidates one-half standard deviation above the nonminority mean on grades, tests, and so on as in the minority/nonminority analysis above, we find that in one case, state residency raises the probability of acceptance from .057 to .134; in another from .036 to .363; and in the third from .073 to .63.

4. In three state schools, residence is such an important consideration that only a token number of nonresidents are admitted, 2 or 3 percent of the class. In these cases, we cannot estimate a meaningful equation measuring the effect of residence.

The patterns we observe in discrimination by sex, race, and residence are only partly related to the system of financing medical education. In the case of residence the relation is clearest. Discrimination against nonresidents may be explicitly announced and related in school policy statements to receipt of state support. Many state schools admit only a token 2 or 3 percent of each entering class from out of state. The effectiveness of pressure to discriminate is derived from the financial support provided by the state, and there is no apparent countervailing federal pressure.

Declining discrimination against women seems only tenuously related to any policy instruments. Perhaps it is best seen simply as a reflection of more general social trends. The effect of affirmative action programs has been felt in hiring of women for faculty positions, but none of the admissions officials mentioned affirmative action in reference to student selection.

For minority applicants the sources of the change we observe are complex and difficult to weigh. The federal government has for several years maintained a program to encourage increased enrollment of minorities. Many schools received special project grants to establish programs to recruit and tutor minority students. Simultaneously, the AMA and AAMC issued an influential policy statement favoring affirmative action. Doubtless these influences had some effect. At each of the schools we have studied, however, apparently complete stories are told of the development of minority programs almost without reference to events on the national level. At some institutions the changes came about dramatically in the wake of the upheavals and confrontations of 1968 and 1969. At others, the process is said to have been one of adopting an idea whose time had come. It seems safe to say that the uniformity and simultaneity of the changes that occurred are due in part to federal policy and programs aimed at increasing minority enrollments, but some portion of the impetus for change came from within the schools themselves.

V. PRIMARY CARE AND SPECIALIZATION

The debate regarding the need for and the training of primary care physicians has a great deal of ideological content. Although no one argues that *fewer* primary care physicians are needed, questions on which there is not widespread agreement are: What problems will more primary care physicians alleviate, what is a primary care physician, and hence what mix of training will he require? The problems to be alleviated include the high cost of care, the quality of care, and the maldistribution of physicians. The primary care physician is variously defined by broad specialty to include internal medicine, pediatrics, obstetrics-gynecology, family practice, and general practice; defined narrowly to include only the last two; self-defined by designating the kind of practice he is in; or defined in more philosophical terms, such as a physician who cares for and treats the whole patient. Given the diversity of opinion about what primary care is and how health care delivery would improve with greater numbers of primary care physicians, a lack of consensus on appropriate training is hardly surprising.

We are not going to try to resolve any of the ideological issues underlying the primary care physician debate. Our research does not address questions regarding the adequacy of supply, and we lack the competence to prescribe in any detail what sort of training a primary care physician should have. However, to address federal policy issues regarding the education of primary care physicians it is necessary to have a working definition of what a primary care physician is and what should constitute his training. The definitional aspects of most interest to us are those that describe attributes of a training program that are amenable to practical analysis.[1] They are in no way suggested as norms.

We will define a primary care physician as one who is competent and willing to provide comprehensive care to and to manage the routine medical problems of individuals who are either basically of sound health or who suffer from a range of straightforward medical problems. Such a physician will be primarily responsible for the management of most of the in-patient care of his patients but may frequently call on specialists for consultation. For unusually complex problems or problems that cannot be adequately treated in the in-patient facilities available to him, the primary care physician may transfer overall patient management responsibility to a specialist.[2]

Nothing in this definition is meant to suggest a hierarchy of competence between the primary care physician and the specialist. Rather the one must be competent to diagnose and treat a wide range of common problems while the other necessarily sacrifices some range for depth of understanding in narrower spheres. For a number of specialties, particularly the surgical ones, this difference may mean that the specialist's practice is weighted more heavily toward in-patient care (as opposed to ambulatory care) than the practice of the primary care physician. However, we do not distinguish between primary care and specialization on the basis of board certification or graduate training but rather on the types of patients a physician treats.

[1] For examples of both earlier and more recent discussions of educational content see Ad Hoc Committee on Education for Family Practice, Council on Medical Education, *Meeting the Challenge of Family Practice*, American Medical Association, Chicago, 1966; and Collin Baker, "What's Different About Family Practice?" *Journal of Medical Education*, Vol. 49, No. 3, March 1974, pp. 229-235.

[2] This definition is substantively similar to those suggested by others. See the references in footnote 1.

TRAINING FOR PRIMARY CARE

Advances in medical science in the past 30 years have greatly expanded the store of knowledge required to practice good primary care. Thus one would expect the formal training requirements of the generation of primary care physicians entering practice today to be significantly greater than those of primary care physicians a generation older who are nearing retirement age.[3] This is reflected in the steadily rising proportion of M.D.s who take some postgraduate training beyond the internship. A study of U.S. medical school graduates from the classes of 1960 and 1964 showed that nearly 90 percent entered residency training.[4] Data on graduates of ten medical schools in our study show that by 1972 about 92 percent of the graduates of the class of 1965 and about 85 percent of the class of 1955 had taken graduate training beyond the internship.[5]

The need of additional training is reflected in the recommendations of the recent report of the Committee on Goals and Priorities of the National Board of Medical Examiners.[6] The report recommends a change in the licensing process that would (1) permit a physician to practice under supervision after medical school—that is, during specialty training—through the use of a limited license; (2) permit independent (unsupervised) practice after completion of specialty practice; and (3) reevaluate clinical competence at periodic intervals through recertification exams that might become a part of formal relicensing. This proposed system is quite different from today's licensing requirements where 39 states require only one year of post-medical-school education, and only New Mexico requires periodic relicensing through participation in continuing medical education.[7]

The changes proposed to the National Board reflect two realities: (1) One year of training after medical school is not sufficient to prepare a physician for independent practice, and (2) the great majority of graduates of U.S. medical schools are, in any case, taking training beyond the internship. These are realities not only for specialists but for the most generalized of primary care physicians, those training in general practice and in family practice. One now takes specialized training to generalize, and there is some consensus that such training is needed.[8]

Those concerned over a shortage of primary care physicians often express the view that academic health centers both provide inappropriate training for primary care and discourage graduates from entering those fields. The arguments supporting the latter rest on a number of subtleties related to the prestige of the superspecialist

[3] This is not to say that the competence of the two generations differs as a function of the formal training received. In addition to the knowledge gained purely from experience, the physician nearing retirement may well have kept abreast of medical science by reading journals and participating in continuing medical education programs. However, other things equal, more training is required today to put a new physician at the "state of the art" level of competence in primary care than was required 30 years ago.

[4] Edithe J. Levit, M.D., Melvin Sabshin, M.D., and C. Barber Mueller, M.D., "Trends in Graduate Medical Education and Specialty Certification," *New England Journal of Medicine*, Vol. 290, No. 10, March 7, 1974, p. 545.

[5] These data are from the AMA Master File of Physicians. Although 87 percent of the class of 1969 had taken residency training by the end of 1972, we would expect the data to underestimate the proportion of that class who will eventually have residency training because a number of them were drafted into the armed services and may have postponed residency training.

[6] *Evaluation in the Continuum of Medical Education*, pp. 41-57.

[7] Ibid., p. 32.

[8] It is important to make the distinction between the training required for a physician to treat the range of problems and perform the procedures permitted by license and the training that is required to perform many of the fairly mundane tasks of everyday practice. The former requires medical knowledge and skills of great scope and currency. The latter can probably be performed adequately and more efficiently by other members of a health care delivery team.

clinician, the place of science in the center, and the adverse view that academic physicians have of the local M.D.s; and on the incontrovertible fact that medical students and house staff get much more exposure to in-patient care than to ambulatory care in the centers. We are not in a position to evaluate the subtle effects of the academic health center environment on ultimate choice of practice or to prescribe an appropriate mix of training for primary care physicians. However, it is worth considering the training opportunities relevant to primary care that are provided in the academic health center.

An important element of the training of the primary care physician involves learning how to manage the comprehensive treatment of a patient.[9] The medical student begins clinical rotations by the third year and often during the second year of medical school. However, since these initial rotations constitute the student's first exposure to clinical training, they provide only an introduction to the type of care and the procedural skills used in the different in-patient services. These first rotations normally last only four to eight weeks, and the medical student has time to acquire only limited competence. Hence there is little opportunity to assume responsibility for comprehensive patient management—even under strict supervision. The first such opportunity usually comes when the medical student goes back to one or more services for electives, usually in the last year of medical school. The length of exposure to any set of patients is rarely more than two months, and exposure of that duration would occur only in an extended elective. Thus the practical scheduling problems dictate that the medical student's experience in comprehensive patient management be compressed in time, and that, in turn, means it will occur largely in an in-patient setting.

Extensive training in patient management begins during internship (or the first year of residency for those who omit the internship). As the individual proceeds through the training program, his responsibility increases and the supervisor intervenes less frequently. Since rotations are longer, patient management need not be restricted to the in-patient setting because of the time constraint.

Limited training in ambulatory care is perhaps the most commonly cited deficiency of primary care training in an academic health center. It is clearly true that training in a center is far more heavily weighted in favor of in-patient care than is the practice of the average physician.[10] It is a widely held view that academic health centers have a comparative advantage in caring for patients with complex, acute problems. However, probably the more important reason for the skewness toward in-patient care—certainly the more important policy problem—is the difficulty academic health centers encounter in trying to operate viable ambulatory care centers.

Many of the problems of providing ambulatory care in a teaching setting are economic. Although the addition of teaching to in-patient care adds relatively little in the way of costs of space, equipment, and non-M.D. support personnel, the marginal requirements for these cost elements are substantial when teaching is added to care in an ambulatory setting. Where the quality of service in teaching at outpatient clinics is competitive with that of private medicine, the ratio of costs (excluding the M.D. professional fee) per visit in a teaching setting to costs per visit in a

[9] Comprehensive management, as used here, is distinguished from the "one shot" visit by the on-going nature of and the physician's recurring involvement with the patient's problem. The problem may be either chronic or acute and treatment may be in either an ambulatory or an in-patient setting.

[10] We do not assume that a physician's training in ambulatory care should be proportional to the amount of practice time he will devote to it. Indeed, we can think of no professional training program that allocates time to elements in proportion to the time spent in professional practice. Certainly, such proportional allocations would not hold for lawyers, economists, or engineers.

private (nonteaching) setting appears to fall in the range of 2:1 to 3:1.[11] Since the policies of third-party insurers make no provision for covering the educational costs of ambulatory care,[12] and since the pricing policies of academic health center clinics are constrained by the fact that they are in direct competition with local physicians in the provision of service to nonsponsored patients, these added costs must be funded from other sources.

These difficulties in recovering non-M.D. costs exacerbate the problem of the low rate of professional (M.D.) remuneration for time spent in ambulatory care in a teaching setting. The fact that the joint production of teaching and care greatly reduces the volume of patient care service that can be produced per unit of time means that the potential service income of the faculty is reduced even if it is assumed that clinic out-patients are billed for these services. In point of fact, it is the custom in many academic health center out-patient clinics not to include a professional charge. To do so would substantially worsen their already critically difficult competitive position relative to local physicians.

Some of the medical schools in our sample are launching programs to increase the involvement of their students and faculty in the ambulatory component of patient care, and these programs may prove to be eminently successful in terms of their educational objectives. They will inevitably add to the funding requirements of the academic health center, however, for none of these programs can overcome the basic economic fact that there are no built-in means of reimbursement of the added nonprofessional costs and the reduction in potential faculty practice earnings associated with the substitution of ambulatory teaching for in-patient teaching.

Several points about primary care training seem relevant to federal policy: (1) If defined in terms of the nature of care provided and the scope of physician responsibility for the patient, primary care physicians include more than general practice and family practice. (2) Training for primary care is not training that stops at the end of internship (as it often did a generation ago), but rather specialty training that involves three years of training beyond medical school whether one "generalizes" in family practice or "specializes" in pediatrics, internal medicine, or obstetrics-gynecology. (3) Although medical students are exposed to all these specialties during medical school, curriculum constraints and financial constraints will make it difficult for the schools to provide them with primary care training of the sort that involves comprehensive management of patients in an ambulatory care setting. All these factors lend importance to the medical student's selection of a graduate medical education program.

SPECIALTY SELECTION

Predicting how a prospective student will do in medical school, what type of internship he will choose, whether and where he will continue on to residency, and whether he will ultimately be a researcher, subspecialist, or family practitioner has occupied psychologists and sociologists for many years. The literature analyzing each of these decisions is now voluminous. In general, however, it tells us little of

[11] Since this ratio reflects current rather than "best" management practice, and since the management revolution in hospitals has just begun to influence out-patient operations, we suspect that this ratio can be brought down somewhat. Yet even with optimal management the capital and support-personnel requirements per visit will be substantially higher in a teaching setting.

[12] In certain cases the policies of third-party insurers even discriminate against academic health center clinics.

policy significance about the relations between entering student characteristics and final outcomes.

As we saw in Section IV, modeling the admission process in a way that allows one to make estimates of the probability that a particular applicant will be admitted is quite possible. It is hard to know how to evaluate these predictions precisely, but in terms of the statistical power of the models, we can clearly do well. Students who do well on the MCATs, who have good grades, and who have gone to more demanding colleges are more likely to be admitted. The relations, though, are not perfect.

The largest literature in this general area attempts to find relations between pre-admission characteristics—test scores, grades, and the like—and medical school performance. Measures of performance are typically medical school grades or scores on Part I or Part II of the National Boards. It is difficult to characterize such a large literature simply, but its message seems to be, in general, that there are weak positive relations between most of the possible measures of performance and most of the possible predictors, such as MCATs and undergraduate grades.[13]

The literature on internship selection is smaller and less quantitative. However, it is commonly asserted that rotating as opposed to specialized straight internships tend to be filled by graduates of less well-known schools and by those who rank lower in their classes.[14] A negative relation between taking a rotating internship and rank in class has also appeared in the data on graduates of several of the schools in our sample. Again, there is a weak positive relation.

If we look at a measure of performance after the intern year—Part III of the National Boards—it is also true that those who took straight internships in major teaching hospitals tend to do better. When we control for the higher quality of the interns in major affiliated hospitals (as measured by scores on Part II of the National Boards) the relation remains but is no longer statistically significant.[15]

Finally, having taken an internship in other than a major teaching hospital does reduce the likelihood that one will be able to get one of the most desirable subspecialty residencies. However, the relation is not perfect.

Although there are relations between performance at each stage of the continuum of a medical education and the succeeding stage, relations across more than one such boundary are rarely reported. The number and power of the forces we cannot measure but that affect an individual's plans, perceptions, and capacities swamp the tenuous relations we find at each stage.

Some have argued that the declining proportion of medical school classes going into general practice and family practice is due to the specialist-scientist bias of the medical schools. One assertion has been verified in a number of studies: The proportion of medical students who say they intend to enter a specialty rather than general practice rises through the four years of medical school.[16] This is not surprising. Before entering medical school, a student is likely to have had little exposure to physicians other than as providers of primary care. The student's image of medi-

[13] A good summary of the literature to 1968 is in L. C. Woodward, *The Relative Efficiency of Multiple Regression Analysis and Multiple Cutoff Analysis in the Prediction of Academic Performance in a Selected Medical School*, Ph.D. dissertation, USC, 1968. For recent references see Gough, "The Recruitment and Selection of Medical Students."

[14] See Emily Mumford, *Interns: From Students to Physicians*, Harvard University Press, Cambridge, 1970, Chapter III.

[15] Edithe J. Levit et al., "The Effect of Characteristics of Hospitals in Relation to the Caliber of Interns Obtained and the Competence of Interns After One Year of Training," *JME*, Vol. 38, No. 11, November 1963, pp. 909-919.

[16] See Wanda Young et al., *Factors Affecting Specialty Choice and the Interrelationship Between Specialty Choice and Geographic Location*, CONSAD Research Corporation, Pittsburgh, October 10, 1973, pp. 12-23.

cal practice likely becomes more differentiated (and more specialized) as his contacts with specialists and specialty fields grow. The same sharpening of career intentions could probably be found among law students or economics graduate students and results from the same increase in student knowledge of the discipline. Since the studies that track students' career intentions have all referred to longitudinal data from single schools, they are incapable of distinguishing whether schools that are more "scientific" or "specialty oriented" do in fact send fewer students into primary care fields.

A direct test for the existence of such a "scientific" or "specialty oriented" bias can be made using data from our ten schools. Three variables capture part of the scientific and postgraduate emphasis of a school: (1) percent of faculty salary from federal funds, (2) percent of NIH research grant applications approved, and (3) number of interns and residents in the school's major teaching hospitals per medical student. To characterize specialty training for the classes of 1965, 1969, and 1972 at our sample schools, we tabulated (1) the proportion of the class taking internships in major teaching hospitals, (2) the proportion taking rotating internships, (3) the proportion of the class taking some residency, (4) the proportion taking a residency longer than 36 months, and, for the class of 1965 only, (5) the proportion of graduates in practice who say they are in one of the primary care specialties. We then calculated the correlations across the ten schools between the variables measuring scientific emphasis and those characterizing specialty training. If the research and postgraduate training emphasis of the school were an important determinant of the proportion of the graduating class going into primary care training and practice, we would have expected to find some significant positive correlations. In fact, there were no significant relations. This is not a very powerful test, but such as they are, the data do not support the contention that federal support of research and postgraduate training results in greater specialization of internships, residencies, and practice.

Characterizing the career paths followed by medical school graduates and trying to understand the role of the medical school and the postgraduate training program in determining these paths are important concerns of the study in which we are engaged. We are now compiling data on five classes from each of the ten schools. Information in this file includes premedical school characteristics and performance, medical school grades, National Board scores, and the like; and data drawn from the American Medical Association's Master File of Physicians on postgraduate training, specialty board certification, and practice characteristics. Although the file is as yet incomplete, it is possible to offer some tentative observations from the data we now have.

The timing of the decision to enter primary care or a subspecialty has apparently changed since the 1950s. The earlier classes had to decide soon after graduation, when the student applied for his first residency program. Although later subspecialization remained possible for those who originally chose a primary care residency, few people actually practiced in primary care fields after specializing in their first residency. Now the proportion taking specialized internships has increased, so in most cases the initial decision has been pushed back to before graduation.

In our study of various characteristics of postgraduate training, one variable, rank in class, has been the most consistently significant. Higher ranking students have consistently received more training and have more often trained in major teaching hospitals. Differences among the five sample schools we have examined so far have been irregular, as have the effects of such variables as the age and sex of individuals. Premedical school variables, such as MCATs and science grades, invariably wash out when we try to predict postgraduate training.

A simple division of our population into primary care providers and nonprimary care providers yields almost no interesting statements about school characteristics. The percentage of students going into immediate subspecialization after internship is indistinguishable across our five schools. Other variables, including rank in class, are also insignificant. The lack of the relations we might expect may be caused by the lack of homogeneity within the two classifications. (For example, those who take residencies in internal medicine tend to rank higher in their medical school classes than those going into other primary care fields.) An initial analysis using a more complex division of outcomes than the dichotomy between primary and nonprimary care does reveal individual school effects;[17] these effects should become clearer when all ten schools are considered together.

FEDERAL PROGRAMS AND PRIMARY CARE

The federal government has in the last several years become increasingly committed to expanding the supply of primary care physicians. Many share the administration's view of the importance of this expansion, and we have no basis for questioning this need. However, some apparently view the persistence of this need for primary care physicians as indication of failure or at least deficiencies in the federal programs aimed at expanding the supply of physicians.

To be sure, no provisions of the capitation or predecessor programs specified the kinds of practice students should enter, but at this point it is impossible to determine how expanding medical school enrollment has affected the supply of primary care physicians. Time alone precludes such an assessment. The medical school class of 1972, the first class admitted under the 1968 liberalized HPEA institutional grants, is only now in its first year of residency; the class of 1976, the first class admitted under the CHMTA capitation system, is only now midway through the clinical rotations of the third year of medical school.

Although it is too soon to know how recent medical school enrollment expansion will affect the present distribution of specialties, there is no reason why the government should wait for this knowledge before acting on the primary care front. The government has two alternatives: It could take an institutional approach to influence this decision, which could imply that particular characteristics of academic health centers affect specialty choice; or it could try to influence individual decisions by offering incentives to increase the attractiveness of primary care specialties. Unfortunately, analysis can provide only limited guidance to those concerned with developing programs to influence specialty choice.

As regards the institutional approach, analysis strongly suggests that the costs of providing ambulatory care in a teaching setting are high and that present third-party payment formulae significantly limit the academic health center's capacity to recoup these costs. As yet, our analysis of the effects of institutional environment on specialty selection reveals no significant relationships of the types that federal programs can readily influence. Moreover, that analysis suggests that although there are statistically significant differences between institutions, the reasons for these differences are too subtle to be detected using simple institutional variables.

As regards the government's capacity to influence the practice decisions of individuals, our analysis to date does not identify characteristics that can be used

[17] This observation is based on analysis of a contingency table relating type of first residency (internal medicine, general surgery, other primary care, other nonprimary care, no residency) to school. The value of Chi-squared for the table rejects the null hypothesis of no relation with $p < .01$.

with confidence by an admissions committee seeking to admit would-be primary care physicians. We have also not as yet proceeded far enough with our analysis of the effects of medical educational programs to determine what opportunities there are to influence specialty choice through the curriculum. Approaches involving financial incentives are the subject of the next section.

VI. TUITION POLICY CONSIDERATIONS

No matter how sophisticated analysis becomes, it cannot answer the question of what medical school tuition should be. With all its ramifications, the tuition issue embraces global questions of social welfare, broad questions of the allocative efficiency in human capital markets, and fairly narrow questions of government program efficiency and management. There is no way to integrate such diverse considerations in policy analysis without making a number of assumptions about social values and behavior that are themselves subjects of irresolvable controversy. Certainly, other important social policy questions also have these characteristics and, like the tuition question, they are debated without being resolved.

In the case of tuition, the debate is often diffuse and disorderly. Medical school tuition levels are discussed in a wide variety of contexts and linked with diverse policy objectives. For example: (1) The small size of tuition revenue relative to other sources of medical school revenue is seen as a sign of institutional reluctance to force the beneficiaries of medical education to pay a fair share of costs. (2) Modest tuition levels are contrasted with the high rates of return to the individual's investment in medical education. (3) Questions are raised about high tuition as a barrier to access to the medical profession of the economically disadvantaged. (4) Higher tuition is the mechanism by which some propose to substitute direct student assistance for federal institutional grants to support medical education in particular and higher education in general. (5) Higher tuition is also proposed as a way of gaining the financial leverage needed to make loan forgiveness an effective means of encouraging new medical school graduates to practice in underserved areas.

Our research was not designed to deal directly with tuition issues. However, our work on admissions and institutional finance has led us to examine questions that are relevant to tuition policy. Moreover, in this year's policy debate, not to address any tuition-related questions is to forgo analysis of much that is likely to be relevant to the formulation of new manpower legislation.

Since the whole problem is not analytically tractable, one practical means of dealing with tuition issues is to organize information and limited analysis so as to facilitate consideration of various facets of the problem. We begin by discussing tuition in the context of recent years. Next we discuss—not answer—burden sharing questions: what the costs of education are, who should bear them, and why. Then we address questions regarding the effect of tuition increases on individuals: the effects on individual access to medical education and the effects of different financial aid criteria. This is followed by a discussion of tuition in the institutional context: how tuition decisions are made and how different institutions would respond to incentives for increases. Finally, we discuss tuition in the context of federal program management.

A warning is in order: We make no pretense at complete, much less exhaustive, analysis under any of these headings. Instead our object is to provide some information that is relevant to policy and that is organized in a logical manner.

TUITION IN HISTORICAL PERSPECTIVE

Tuition is a relatively minor element in the aggregate financial pictures of both medical students and medical schools. This situation does not appear to have

changed in recent years. For the student, the opportunity costs of medical education (the amount of earnings forgone during the education period) dominate tuition costs. For the school, revenue from tuition is small compared with that from other sources.

Since 1958, when the American Association of Medical Colleges began collecting comprehensive financial data, tuition has never appeared as an important source of support for medical schools. In the academic year 1958–1959 tuition and fees accounted for about 14 percent of the "operating support" of the combined budgets of the 85 reporting schools.[1] By 1971–1972, although tuition and student fee earnings had tripled, their importance in aggregate terms had declined to about 9 percent of operating support—only 4 percent of total support.

These percentages suggest that tuition adjustments are likely to have very marginal effects on schools' overall financial situations. However, such averages may be misleading. Tuition levels vary widely across schools, and the school with the highest tuition earnings received over $5.3 million from that source in 1971, which is more than the largest award under the federal capitation program. Figure 2 shows the distribution of tuition rates for two recent years. However, it is difficult to interpret these figures, even ignoring the problem of averages, because tuition earnings are treated in different ways in different school settings. For example, in some public schools, tuition earnings are treated as general revenue for the state, not the school. Tuition in private schools is usually a substantial part of the small amount of discretionary funds at the disposal of the dean or vice president.

Most medical schools have increased tuition rates substantially in recent years although the relative importance of tuition in their budgets seems to be declining. In part, this decline is due to the large increase in other sources of budget revenue. For example, professional fee income grew at an annual rate of 37 percent between 1966–1967 and 1971–1972.[2] However, another factor of importance is the effect of inflation. Table 8 shows that the substantial increases in tuition have been eroded by the inflation that has occurred in recent years.

Data on the average annual expenses of medical students in 1967–1968 and 1970–1971 are shown in Table 9. Using the living cost data from the latter year and proposed tuition and expense data, we have projected costs for 1974–1975. Tuition accounts for most of the difference in average student expenses between public and private schools. Average expenses vary by school class at medical school (for example, the average for single seniors was 14 percent higher than that for single freshmen) and by marital status (for example, expenses for sophomores with one child were 71 percent higher than for single sophomores).

Although tuition accounts for much of the difference between average costs in private and public schools, the opportunity costs of medical education tend to swamp direct educational costs (tuition, fees, books, and so on). There is no wholly satisfactory way to measure what a medical student might earn during the period in which he or she is in medical school, but some reasonably satisfactory proxies may be drawn from data on college graduate employment opportunities.

The College Placement Council publishes data showing salary offers by curriculum and type of employer during each year. The data on opportunity costs in Table 9 are drawn from this source. Offers to chemistry bachelor's degree candidates by chemical, drug, and allied products firms seem closest to medical student career

[1] "Operating support" is not conceptually a very satisfactory financial category. It contains revenues that are not clearly earmarked for a particular activity, such as research or training. However, for the purposes of this comparison, it has the advantage of not changing significantly in the aggregate definition. Data are from *JAMA*, November 19, 1973, Vol. 226, No. 8. The most recent year for which data are available is 1971—1972.

[2] *JAMA*, November 19, 1973, Vol. 226, No. 8, p. 919.

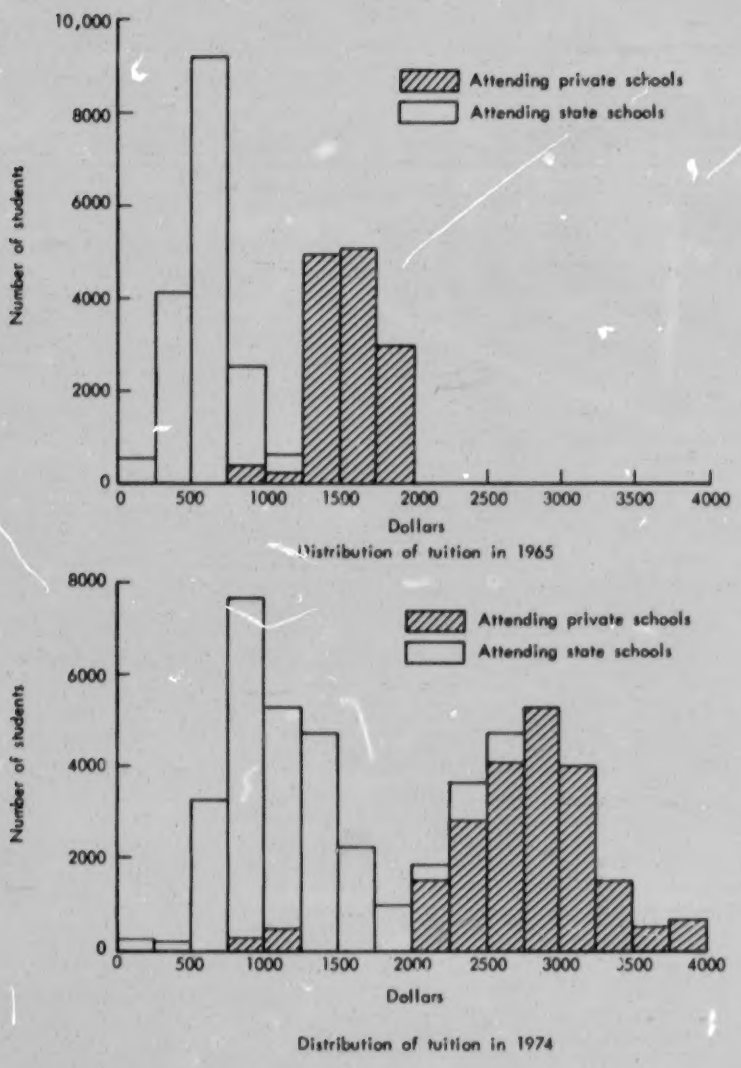

Fig. 2—Distribution of tuition by school type

Table 8

AVERAGE TUITION PER STUDENT[a]

Year	Current Dollars		1973 Dollars		Total Students	% Students in State Schools
	Private Schools	State Schools	Private Schools	State Schools		
1965-66	$ 1570	$ 620	$ 2178	$ 860	31,076	52.6
1966-67	1668	645	2249	870	31,145	53.5
1967-68	1668	642	2187	842	32,414	53.8
1968-69	1910	683	2403	859	33,451	53.9
1969-70	1899	678	2267	810	34,710	52.4
1970-71	2262	799	2549	900	37,733	53.7
1972-73	2245	788	2349	825	44,027	55.3
1973-74	2414	836	2414	836	46,676	54.5
1974-75	2835	1195	2610	1100	47,546	54.8

SOURCES: *The Journal of the American Medical Association*, Education Number, various years. Association of American Medical Colleges, *Medical School Admissions Requirements*, various years.

[a]Because of a change in reporting format, reliable data for 1971-72 were not available.

alternatives.[3] Since the nonagricultural sciences (chemistry, mathematics, and physics) were aggregated in earlier years, we used this combined category for 1967–1968 and 1970–1971.[4] The mean offer in 1974 for these positions was $900 per month ($10,800 per year). However, this mean probably substantially understates the earning capacity of those admitted to medical school. Our admissions data suggest that those admitted to medical school tend to be the top 15 percent of college graduates.[5] Thus it may be more defensible to use the top 10 percentile offer of $1,020 per month ($12,240 per year) as an estimate of opportunity costs.

Adding these opportunity costs to the direct costs of tuition and educational expenses gives total educational costs to the individual. For the academic year 1974–1975, the average tuition for private students will be $2,835 and for public schools $1,195; and average costs for books and other materials (excluding microscope) are estimated at $325.[6] Thus total annual educational costs for the average private medical school student is in the $13,960–$15,800 range and for public schools $12,320–$13,760, depending upon assumptions about opportunity costs. In either case direct costs are a small part of the total—20–23 percent for public schools and 11–12 percent for private schools.

The state of our understanding of the importance of the tuition expense to individual students is in some ways analogous to our understanding of the importance of tuition revenues to institutions. In both instances, we have reason to suspect that the averages may obscure important differences among individuals and institutions. We also observe that tuition has been historically and still is a relatively small

[3] The College Placement Council, "CPC Salary Survey," Report No. 2, March 1974.

[4] College Placement Council, "A Study of 1966-1967 Beginning Offers by Business and Industry"; "A Study of 1969-1970 Beginning Offers by Business and Industry."

[5] See Section IV, pp. 23.

[6] Association of American Medical Colleges, *Medical School Admission Requirements, 1974-1975*, 22 ed., Washington, D.C., pp. 77-305. *JAMA*, November 19, 1973, Vol. 226, No. 8, pp. 900-902.

Table 9

AVERAGE ANNUAL COSTS FOR INDIVIDUALS ATTENDING U.S. MEDICAL SCHOOLS (1973 prices)[a]

	1967-1968	1970-1971	Projections[b] 1974-1975
Out-of-Pocket Expenses			
Public school total	$5,055	$5,689	$5,605
School expenses (tuition, books, etc.)	1,335	1,509	1,425
Lodging	1,207	1,407	1,407
Board	1,072	1,066	1,066
Other expenses	1,441	1,707	1,707
Private school total	$6,207	$7,038	$7,193
School expenses (tuition, books, etc.)	2,603	2,780	2,935
Lodging	1,108	1,454	1,454
Board	1,184	1,134	1,134
Other expenses	1,312	1,670	1,670
Opportunity Costs[c]	$11,053-11,707	$11,261-12,395	$10,093-11,439

SOURCES: U.S. Department of Health, Education and Welfare, Public Health Services, Health Resources Administration, *How Health Professions Students Finance Their Education*, DHEW Publication No. (HRA) 74-13, October 1973.

L. C. R. Smith and A. R. Crocker, *How Medical Students Finance Their Education*, U.S. Department of Health, Education and Welfare, Publication No. 1336-1, Washington, D.C., 1970.

Economic Report of the President, Washington, D.C., 1974.

JAMA, November 19, 1973, Vol. 226, No. 8, p. 919.

Association of American Medical Colleges, *Medical School Admissions Requirements 1974-1975*, Washington, D.C., 1973.

College Placement Council, "CPC Salary Survey," Report No. 2, March 1974.

College Placement Council, "A Study of 1966-67 Beginning Offers by Business and Industry"; "A Study of 1969-70 Beginning Offers by Business and Industry."

[a]Bureau of Labor Statistics on consumer prices are used to adjust data to 1973 prices. School expenses, lodging, board, and other expenses were inflated by indexes of prices for all items, rent, food, and nonfood commodities.

[b]Projections for 1974 assume all expenses the same as 1970-71 except school expenses. Tuition levels are drawn from *JAMA*, "Education Number," November 11, 1973; public school tuition is for residents. Other educational costs are based on an average of estimates in *Medical School Admissions Requirements, 1974-1975*.

[c]Opportunity costs are from College Placement Council data for chemists in the chemical, drugs, and allied products industries. Ranges shown are from the mean to the 90th percentile.

element in the financial picture for both individuals and institutions. At the same time, the aggregate financial picture may not be the most relevant context to use in judging the importance of tuition costs or earnings. For the student, tuition is a bill that must be paid when due and is a significant part of his cash flow problem; opportunity costs, though relevant to a student's educational investment decision, are hypothetical dollars he never actually sees or has to worry about after deciding to go to medical school. For the institution, the importance of tuition is determined not so much by its size relative to other revenue sources but rather by the discretion the administration has in using tuition revenue.

BURDEN SHARING OF MEDICAL EDUCATION COSTS

Education is an investment with benefits accruing to the individual who receives the education. The benefits of an individual's education usually also accrue to the society of which the individual is a part. Because the existence of these joint benefits is widely accepted, educational cost burden sharing issues arise: How should costs be divided between the student and the taxpayers (society)? Thoughtful answers require assumptions about social values and the allocative efficiency of markets.

The educated taxpayer's and the government policymaker's particular interests in the burden sharing with respect to medical education logically stem from several simple, readily available facts: (1) The federal government gives money to medical schools to support medical education programs and bases that support on the number of students enrolled; (2) many more people want to go to medical school than are admitted, but tuition is about on a par with other graduate programs; and (3) by appearances and by statistics, physicians' earnings are high. Given this interest, the burden sharing problem breaks down into two parts: What does it cost? Who should pay how much?

The Cost of Medical Education

Analyses of medical education costs invariably run afoul of the problem of joint production, and for good reason. Academic health centers are involved in joint production in the broad categories of education, research, and care; and the education process is itself a joint production activity involving Ph.D. basic science students, interns, residents, and frequently other health professionals, as well as medical students. The problem arises when the consumers of these different products—or those who are willing to subsidize the consumption of others—insist on the simple, seemingly very reasonable principle that they pay only their share of costs.

Since only a relatively small portion of total costs are pure costs associated with a single product, there is no conceptually unambiguous way to allocate a substantial portion of the costs—that is, the joint costs—of the products of the academic health centers.[7] A number of "reasonable" cost allocation approaches have been suggested. A recent study by the Association of American Medical Colleges (AAMC) used the criterion that all the salary costs of any faculty member who devoted at least 35 percent of his effort to the instruction of undergraduate medical students (the remaining effort divided between other education activities, administration, research,

[7] For a discussion of the joint production/joint cost problem, see John E. Koehler and Robert L. Slighton, "Activity Analysis and Cost Analysis in Medical Schools," *Journal of Medical Education*, Vol. 48, June 1973.

and patient care) should be attributed to undergraduate education programs.[8] The education cost component was reduced proportionately for undergraduate education effort reports of less than 35 percent. Using this criterion, the AAMC study found annual per student costs ranging from $16,000 to $26,000.

In 1971, the U.S. Congress even mandated a study by the Institute of Medicine (IOM) to find the "average annual per-student education costs" for schools of medicine and other health professions.[9] Like other studies, the IOM study based cost estimates on faculty activity reports. However, the methodology used in data collection for the IOM represents an advance over earlier cost allocation efforts in that the faculty respondents were asked to record time spent on joint activities (such as patient care and teaching) separately rather than arbitrarily allocating it between the joint activities.[10] Then they made judgments about "portions of the research and patient care programs considered essential to education."[11] The results were education cost estimates ranging from $6,900 to $18,650.

The AAMC and IOM studies are similar in their use of faculty activity reports to estimate costs of education. The results are different in part because the assumptions are different. Both sets of assumptions are plausible, but they also involve judgments about which there are reasonable questions and no unambiguous answers. Any unequivocal single answer to the question of educational costs must necessarily have its origins in judgment, bargaining, or politics, not in a deterministic cost analysis.[12] Moreover, unlike the oil refiner who must also price joint products, those who price the joint products of academic health centers have little in the way of direct market signals to guide their decisions.

The Institute of Medicine did suggest a new concept to provide the basis for federal capitation grants and, by implication, for burden sharing. "Net educational expenditures," the new concept, stems not so much from their cost analysis efforts as from budget realities.[13] It is the portion of calculated education costs that are not offset by income from patient care and research activities. The appeal of this concept lies in its implicit realism: Analysis cannot identify an unambiguous cost basis for educational burden sharing, but budget reality can identify a residual financial burden that must be shouldered if the institution is to survive in its present form.

Bases for Dividing the Burden

If an educational cost figure can be established through some combination of accounting conventions and bargaining, the problem becomes one of developing a basis for dividing that cost among those who are willing to pay. The principal

[8] Association of American Medical Colleges, *Undergraduate Medical Education, Elements—Objectives—Costs*, Report of the Committee on the Financing of Medical Education, October 1973.

[9] Public Law 92-156, Section 205.

[10] *Costs of Education in the Health Professions*, National Academy of Sciences, Washington, D.C., 1974.

[11] To arrive at a "cost of education," the IOM added the costs of preparation and instruction, the costs of research up to a proportion of time devoted to instruction (up to 67 percent of instruction time for basic science faculty and 30 percent for clinical faculty), all the time devoted to joint teaching and patient care, and a pro rata share of the costs of other activities. Ibid, pp. 65-72.

[12] One conceptually unambiguous cost concept is the pure cost of undergraduate medical education—the cost to the academic health center of adding that educational activity to a joint production system that was producing all the other joint products. The problem here is not with the concept but with finding an accurate and practical means of estimating that pure cost. The data from the IOM cost study could yield such a pure cost figure. However, faculty effort reports, the methodology used to collect the cost data, are vulnerable to misunderstanding and biases of the faculty respondent. It is possible that some validity tests can be developed to determine the extent of such errors in the IOM data.

[13] Ibid, p. xv. This concept is similar to what we refer to as "dean's cost" in Section VII.

candidates for shouldering the burden are state, local, and federal governments acting in the interest of society, and the individual acting in the interest of his career.[14]

From the purely economic point of view, an investment in education is a sensible one for the individual when the returns are high relative to alternative investments. A number of discounted present value calculations of earnings streams show lifetime rates of return at least in the 15–20 percent range for a physician's educational investment.[15] Any entrepreneur offered an investment with a lifetime rate of return in that range would probably evince some interest. Thus, human capital theory suggests that the individual physician's education should be an eminently bankable private investment. As a practical matter, it might be difficult to find a private banker willing to lend for such an investment with no collateral and a four-year grace period for repayment, but educational loan programs appear to have overcome some of these problems. The point is simple: A medical education is a very valuable private investment good, one that the physician should be willing to pay for even though society wants more doctors and more medical care and is willing to use tax dollars to get them.

This point is fundamental to the proposals for shifting federal support of medical education from institutional grants to student assistance in the form of loans. The proposals presume that the institutions would recapture federal funds by raising tuition and that the student would borrow more from both the federal government and private sources. Over the long term, costs of supporting the medical education system would be shifted from the general public to those who benefit from the high earnings attendant on medical education.[16]

The effectiveness of such a policy will depend in part of the nature of the educational costs and on students' willingness to borrow to cover those costs. Most medical student financial data are reported in aggregates that potentially obscure important differences across institutions and student categories. The recent data show that, as late as the school year 1970–1971, loans were a relatively unimportant source for financing out-of-pocket total student expenses (school expenses, lodging, board, and miscellaneous). A survey showed that in public schools only 20 percent of such expenses and in private school only 17 percent were covered by "refundable sources."[17] Although 72 percent of the 1971 medical school seniors had debts, their average indebtedness was only $5,504.[18] This represents a substantial increase over the proportion of seniors (52 percent) reporting debts in 1967. However, when their average dollar amount of indebtedness ($4,397) is adjusted for inflation, the 1971 average is only about 3 percent above the 1967 levels.[19]

[14] The portion of costs not borne by the individual is likely to be covered by fungible resources in the overall institutional budget. These funds may come from a number of sources, including gifts from philanthropists, earnings from practice, and government. However, government sources are the only ones of these likely to be of policy significance.

[15] Cf. Frank A. Sloan, "Lifetime Earnings and Physicians' Choice of Specialty," *Industrial and Labor Relations Review*, Vol. 24, No. 1, October 1970, pp. 47-56; Rashi Fein and Gerald I. Weber, *Financing Medical Education*, McGraw-Hill Book Co., New York, 1971, pp. 245-253.

[16] Committee on Labor and Public Welfare, U.S. Senate, 93rd Congress, First Session, *Hearings on Caspar W. Weinberger to be Secretary of Health, Education and Welfare*, Part 2, Appendix, "Comprehensive HEW Simplifications and Reform 'MEGA Proposal.'" Washington, D.C., 1973. A discussion of the overall student assistance philosophy is contained in pp. 57-70. The application of the philosophy to health manpower is discussed on pp. 120-125.

[17] U.S. Department of Health, Education and Welfare, Public Health Service, Health Resources Administration, *How Health Professions Students Finance Their Education*, DHEW Publication No. (HRA) 74-13, October 1973.

[18] Ibid; pp. 40-41.

[19] L.C.R., Smith and A. R. Crocker, *How Medical Students Finance Their Education*, U.S. Department of Health, Education and Welfare, Publication No. 1336-1, Washington, D.C., 1970.

The case for raising tuition assumes that student behavior with respect to the educational investment is based on at least implicit calculations regarding rates of return. The data on indebtedness do not shed much light on the question of students' willingness to borrow large amounts to finance their education, but past analyses of physicians' educational investment behavior raise questions about the role of economic rationale in their decisions. Sloan's calculations, like others, showed rates of return to the medical school and internship investment declining from 29.1 percent in 1955 to 24.1 percent in 1965. These rates of return, despite the modest decline, should certainly be high enough to provide incentives for the "economic man" to invest in his education. However, during this period we observe a steady rise in the proportion of medical school graduates entering specialty training, where the internal rates of return appear to be unattractive. Sloan calculates low rates (1 to 7 percent) in general surgery, obstetrics-gynecology, and psychiatry, and negative rates in internal medicine and pediatrics. In 1965, radiology specialty training showed a very attractive 16.1 percent rate of return.[20] Yet radiology was below the median of specialties in residency positions filled (80 percent)—below both pediatrics (85 percent) and internal medicine (87 percent).[21]

This does not mean that economics is unimportant in an individual's educational investment and career decisions. Sloan's analysis, like others, bases calculations on the record of past earnings. A would-be physician, considering the educational investment, is concerned with the future and he may assume different economic circumstances. His decision is also surely influenced by nonpecuniary considerations, such as intellectual stimulation and prestige.

Policy proposals that pertain to the appropriate individual share of the educational investment cost burden assume something about effectiveness of market forces in calling forth investment. Similarly, policy proposals that pertain to the appropriate share of the cost burden to be borne by society make assumptions regarding the efficiency of markets in eliciting individual responses that will satisfy the needs of society.

If with substantially higher tuition costs the economics of the medical profession still attract sufficient numbers of well-qualified and motivated college graduates to medical schools, and if market forces result in the medical school graduates' making specialty and location decisions that are consistent with society's needs, there would be little justification for federal subsidy to medical education. Medical school places could be allocated on the basis of the individual's willingness to pay the investment costs. Under these assumptions, those who were best qualified would be the most willing to pay the higher costs of education because they could expect the greatest returns to their investment.

We know of no one who argues that at present the "market" for health care is characterized by a high degree of allocative efficiency. Some argue for something approaching a *laissez faire* market for medical education in which tuition levels, not admissions committees, would restrict entry to medical school.[22] Accreditation would not limit the number of schools, but schools would be judged by their capacity to produce graduates who could pass licensure examinations. Most proposals for change are more incremental. Tuition would be raised to levels that would discourage "marginal" applicants by making medical careers less financially attractive but

[20] Sloan, "Lifetime Earnings and Physicians' Choice of Specialty," p. 48.

[21] *JAMA*, November 21, 1966, Vol. 198, No. 8.

[22] Rueben A. Kessel, "The AMA and the Supply of Physicians," *Law and Contemporary Problems*, Vol. XXXV, No. 2, Spring 1970, pp. 267-283.

not so high as to make the investment unattractive to the well qualified.[23] Federal intervention in the market for physicians' services would continue, but the form of intervention would shift from across-the-board subsidies to institutions to selective subsidies to individuals.

These proposals reflect policymakers' evident dissatisfaction with the present distribution of physicians by specialty and location of practice. Scholarships and loan forgiveness would be available to those who chose to practice what and where the government indicated, but the remainder of physicians would be expected to bear a greater portion of the burden of educational costs. The implicit underlying assumption is that market forces work sufficiently well to meet society's physician supply needs in most but not all areas.

FINANCIAL BARRIERS TO MEDICAL EDUCATION AND STUDENT AID

A persistent argument against raising tuition is that it would keep low income students from obtaining medical education. At some tuition level, that would become a problem. It is difficult to determine what that level is because students from low income families might react to the financial barrier by selecting themselves out of the competition for medical school places rather than by applying and encountering the financial barrier after being admitted.

Our information on financial barriers comes from our work on the admissions process and hence deals only with those who actually apply to medical school. For this group, barriers based on inability to pay for a medical education seem to have disappeared. In all but one of the schools we have studied, the admissions committee action must be unrelated to an applicant's ability to pay because information on an applicant's financial status is not gathered until after the admission decision is made. At the one exception, applicants were asked to indicate whether they intended to apply for financial aid. However, when a dummy variable for this response was included in the admission equations it was unrelated to the outcome.

Schools have been unable to make advance commitments, in any case, since the level of funding for the Health Professions Loans provided by the federal government has remained undecided until mid-summer or beyond because of delays in Congressional appropriations; schools have not known how much money they would have until the class had nearly matriculated or even later. Considerations of income forgone and unwillingness to forgo income for additional education may still prevent potentially qualified applicants from applying to or preparing for medical school, but once candidates reach the stage of application, ability to pay appears to have become irrelevant. That this is so is due in part to the growth of federal loan programs and to the extension of loan guarantees, but the role of the private capital market appears to be growing as well.

There is some interaction between minority opportunities and financial aids. Although evaluation of a medical student's total need for financial aid is determined in most cases by a standard formula and procedure, the proportion that is loan rather than scholarship is varied by the schools in order to compete for qualified minority applicants. Thus, although the total size of the financial aid package received may be the same for all students with similar resources, the combination will be somewhat more favorable for minority students.

[23] "Message from the President of the United States Transmitting Proposals for Improving Health Care," Washington, D.C., February 20, 1974.

Although the present cost of medical education appears to be well within the bounds that any student can afford to finance, that may not be true for tuition levels sufficient to replace federal institutional support. The terms of federal loans are attractive, but the current $3,500 per year limit is too low to cover even half the out-of-pocket costs of a student at many private schools at current tuition levels. Moreover, the allocation of federal funds to medical schools (that administer the loan program) have been insufficient to permit many students access to funds—much less to borrow the maximum amount permitted by law—and are apparently substantially below amounts required to meet student requests.[24]

This raises the difficult problem of financial aid criteria. Recently, access to student aid—scholarships and subsidized loans—has been based in large part on financial need as measured by income of the student's parents. This is consistent with widespread concern regarding effect of financial barriers to medical education. However, to the extent that higher tuition levels are justified on grounds of the return to the medical education investment, financial need criteria—particularly as related to parental income—are of questionable relevance. The son or daughter of low-income parents can be expected to earn as high an income from medical practice as the son or daughter of wealthier parents.[25]

The financial need criterion assumes no independence of students from parents. Yet most medical students are in the 22–26 age range. By this age, parents might expect their children to be largely or completely financially independent whether they are in school or working. This is also an age during which society may have an interest in promoting the financial independence of one generation from another. In any case, the 1970–1971 data suggest that parental contributions cover only a relatively small proportion (20 percent) of students' out-of-pocket expenses.[26]

The point here is not to take issue with current criteria for allocating federal loan funds. Rather it is to point out that at present federal funds are rationed by the individual medical schools that administer the funds. The implicit criteria for rationing are probably not consistent with those of a system that would place more reliance on market forces to encourage students to shoulder more of the educational cost burden. Yet the present excess demand for federal loans makes rationing inevitable, and the growing demand for loans in the face of tuition increases will make the situation worse unless the federal government adjusts the terms or allocations or both to achieve a market equilibrium.

TUITION AND INSTITUTIONAL DECISIONMAKING

The philosophy underlying proposals to shift federal aid from institutional support to student assistance does not seem to contemplate direct intervention in tuition policy to the extent of dictating tuition increases directly.[27] The design is to create incentive for institutional action on tuition by reducing federal institutional support.

[24] In fiscal year 1973, for example, schools of medicine requested about $30 million in loan funds and received about $19 million. Loans were made to only 29 percent of eligible students and the average loan was $1,480. Subcommittee on Department of Labor and Department of Health, Education and Welfare, U.S. Congress, 92nd Congress, 2nd Session, *Hearings, Department of Labor and HEW Appropriations for 1973*, Part 4, Washington, D.C., 1972, p. 1100.

[25] This assumes that the two hypothetical students have equal financial burdens related to their undergraduate education, which may or may not be the case.

[26] Department of HEW, *How Health Professions Students Finance Their Education*, p. 21.

[27] Committee on Labor and Public Welfare, "MEGA Proposal," pp. 57-70.

The responsiveness to these incentives may depend on how and by whom institutional tuition decisions are made. This differs sharply between private and public institutions. Private school tuition levels appear to be governed largely by the financial exigencies of the school and by the price setting behavior of the rest of the public and private schools. The dean or vice president either governs tuition or is the key source of recommendations to the university president or board of trustees.

By contrast, deans of public schools appear to have a limited voice in tuition decisions, which are typically resolved at the state level. There appears to be substantial interplay among administrators of the state university system, the governor, and the legislature; and tuition increases are generally regarded as politically unpopular. Moreover, as we understand the resource allocation processes of state university systems, tuition receipts are often not earmarked for the budget of a particular institution, such as a medical school, but are instead treated as general revenue for the entire university system.

This may largely account for what is, broadly speaking, a two-price system with high tuitions ($2,835 mean) for private medical schools and lower tuitions ($1,195 mean) for public schools.[38] (See Figure 2.) Rationing in this system discriminates heavily in favor of residents. In the absence of direct federal intervention, the two-price system seems likely to persist. Private schools would tend to respond to federal incentives for tuition increases, and public schools would yield to political forces.

In an ordinary market, a two-price system will operate inefficiently, and we are inclined to put forth an analogous argument in the case of medical education. However, it is difficult to sort out the aggregate effects of the two-price system because of the different situations in which residency discrimination takes place.[39] For purposes of explanation, it is useful to consider three situations in which the attractiveness of hypothetical state and private schools are the same except for the tuition differential.

In the first case, assume the number of places in a state's public medical school is proportional to the number of "qualified" applicants from that state. Under such circumstances (assuming state and private schools are of equal quality), one would expect the best students to go to the state school where costs are lower, and the quality of the school's education program would probably be raised by the higher quality students. The pool of students entering private schools from the subject state would be lower, the national average private school entrant quality would be correspondingly lower, and the educational programs of private schools would probably suffer.

In the second case, assume the number of places in a state's public medical school is greater than the number of students from that state who would be admitted to medical school if they were competing in a system that did not favor residents. Under these circumstances, the state school will take less qualified students than it would take if not restricted to residents; schools drawing applicants from the national pool of applicants outside the state would be able to draw from a somewhat more qualified pool of applicants, but applicants who were better than some of those in the state school would be denied admission to any school.

[38] These are means, weighted by the number of students enrolled. Public school data are for residents, but students are generally able to establish residency status within one year of enrolling at a state school. This and sampling error account for differences between these data and data on school expenses in Table 9.

[39] We expect to analyze the effects of residency discrimination at more length using data on the national applicant pool and all school admissions. Contingent upon access to data, this analysis will appear in a subsequent report.

In a third case, assume a state with a state school (low tuition) and a private school (high tuition) that receives some state aid in return for discriminating in favor of state residents in its admissions decisions. Under these circumstances, the state school will enroll the best students from the state and the private school (assuming the schools are of equal quality) will enroll state residents who are in all cases inferior to those residents in the state school.

These examples seem unrealistic only in their assumptions about "equality" of the hypothetical schools. Medical schools have many complex attributes that make it impossible to develop a unidimensional measure of quality, and thus personal tastes may play an important part in school choice. However, this modifies but does not negate the effects of tuition differences on the student composition of state and private schools. From the point of view of the state, an across-the-board tuition subsidy to prospective physicians is hard to justify. From the point of view of national welfare, differential tuition rates seem likely to result in an inferior match between student attributes and school attributes.

FEDERAL PROGRAMS AND TUITION LEVELS

The federal government interest in tuition policy logically stems from three concerns. One is budgetary and relates to the burden sharing of educational costs among the government, the student, and other parties. Another is the effects of different tuition levels on the mix of students entering medical schools and the nature of their practice when they enter the profession. A third relates to the effect of federal policy with respect to tuition and student assistance on the institutional viability of the academic health centers.

The government has gone to considerable expense to measure the costs of medical educational programs with at least the implied objective of determining the size of the cost burden to be shared. While we have heard no one argue that an appropriate burden sharing formula can be arrived at through analysis (as opposed to bargaining), there is a widespread view that the size of the burden can be established definitively through careful analysis. However, that is not the case. Allocating costs in a joint production process requires the same sorts of arbitrary and normative definitions that burden sharing formulas require.

This does not mean that there is no basis for redistributing the financial burden of medical education. If those qualified to enter the medical profession weigh the cost of their education against the evidence of expected lifetime earnings provided by today's physician incomes, they would conclude on purely economic grounds that the investment was sound—even at substantially higher costs. We would not expect them to offer to bear a larger burden of the costs through increased tuition, but neither would we expect moderately higher tuition to tip the economic balance of their calculations. Moreover, if they applied to medical school, they would find sources of funds sufficient (at present costs) to permit them to finance their education costs on terms that are economically attractive.

Although the investment in medical education appears wise on economic grounds, many factors other than economics enter into the career choice decision of individuals. In recent years, the government has become increasingly concerned about attracting qualified individuals to medical schools who would not have otherwise applied or been admitted, and it has provided liberal student assistance to achieve this objective. However, since the disadvantaged student as well as the student from a wealthy background can expect a very attractive return on the

educational investment, such aid is better viewed as removing social barriers rather than economic barriers to medical education.

Although the federal government is proposing to use economic returns as a rationale for shifting the financial burden of medical education from the taxpayers to the medical students, it is not proposing to relegate specialty and practice location decisions to market forces. In fact, by increasing the size of the educational burden to be borne by the individual, the government expects to gain more leverage to influence individual decisions through scholarships and loan forgiveness. The effectiveness of such a policy is difficult to judge in advance, but the administrative problems of developing criteria for assistance seem substantial.

Underlying the proposals for shifting the financial burden of education from the federal government to the medical students is an implicit assumption about the behavior of the academic health centers in the face of cutbacks in institutional support. This behavior is difficult to predict not because of the unclarity of economic incentives faced by the centers but because the control of tuition levels in many public medical schools is not in the hands of the school administrators. If the gap between public and private school tuition increases, the private schools will be weakened and residency discrimination will adversely affect the overall quality of medical school classes.

The policy problem for the federal government will be what, if anything, to do in such circumstances. The MEGA proposal recognized this problem explicitly in its general discussion of higher education:

> Even if most Federal resources for higher education are channeled through the market place, as proposed here, responsiveness to market forces will be muted because the far larger resources of the States are channeled almost exclusively to public colleges and universities in the form of institutional support. The result is a pervasive difference between the price of public and private higher education that has nothing to do with either real costs or relative effectiveness. . . .
>
> Because the States seem unlikely to make a substantial shift from a tuition subsidy mechanism without extrinsic incentives, a major role falls to the Federal Government. The situation is in many ways the exact opposite of one calling for a "no-strings" revenue sharing strategy. Though the ultimate objectives of State and Federal policy are the same, the States pursue those objectives through allocation mechanisms which are substantially counterproductive. Classic revenue sharing, e.g., turning over Federal student or institutional aid funds to the States with no strings attached, would (disregarding substitution effects) increase the undesirable subsidy differential between public and non-public institutions. The case is one where a set of carefully structured Federal levers may be needed precisely in order to change State policies.
>
> The alternatives to a policy of incentives for shifting State funds to student aid seem inadequate or unacceptable.[30]

To develop a set of incentives that will induce the states to make such a shift in their educational funding programs will certainly be a demanding task in program design and political bargaining. At present, there is little more than a crude theory for what incentives might be effective in higher education in general, and no plans for dealing with the special problems of medical education.

[30] Committee on Labor and Public Welfare, "MEGA Proposal," pp. 64a-65a.

VII. INTERDEPENDENCIES BETWEEN HEALTH MANPOWER LEGISLATION AND OTHER FEDERAL HEALTH POLICIES

The effect the federal government has on the decisions of academic health centers as to the size and composition of their student bodies, the length and content of training, and the prices charged for this training is by no means limited to health manpower legislation. The academic health center is engaged in the joint production of a complex variety of education, research, and patient care outputs. The willingness and ability of such institutions to meet a particular education-output target thus necessarily depend on the total set of incentives and total flow of resources facing them. The circumstances of the educational processes in academic health centers are such that the quantitative dimensions of joint production are extremely important. The costs of educational outputs are strongly dependent on the levels of the research and patient care outputs of the academic health center, and a reduction of funding for these activities will result in an increase in the costs of educational outputs and a reduced willingness and ability of these institutions to meet given education output targets. This interdependence also extends to different education products. A reduction in funding of graduate medical education will generally result in an increase in the funding requirements of undergraduate medical education.

PROGRAM COSTS AND PROGRAM FUNDING REQUIREMENTS IN ACADEMIC HEALTH CENTERS

To understand the nature of the interdependencies between the costs and funding requirements of the undergraduate medical education program and the other programs of academic health centers it is necessary to understand two basic cost "facts." The first of these is the ambiguity of the concept of program cost in circumstances of joint production. Where the cost of a program is dependent on the levels of the other programs of the institution, it becomes moot whether the cost concept appropriate to that program is the cost of creating that program from scratch or the cost of creating it as an add-on to the existing programs of the institution. The second of these "facts" is the large variation among programs of the price of the time of M.D. professionals—the single most important input into academic health centers. The price charged by an individual professional for time spent in an education program is complexly related both to the price he is able to charge for time devoted to patient care and to the proportion of his time allocated to patient care activities.

Bargaining over Joint Costs

The ambiguity of the concept of program cost in circumstances of joint production derives from the inherent ambiguity of joint costs. To which program should they be assigned? If each program sponsor funds the cost of starting the program from scratch—that is, add-on costs plus joint costs—total institutional revenue will exceed total costs. Joint costs will be funded two or more times. Yet if each program sponsor funds only the add-on costs of that program, joint costs will not be covered and the institution will incur a loss.

In practice, this conflict between institution and sponsor is resolved through a bargaining process in which sponsors try to minimize their share of joint costs and institutions try to assign responsibility for joint costs to those programs with the greatest ability or willingness to pay. Cost accountants have derived a variety of formulae for assigning each sponsor its "fair" share of joint costs, but these formulae are better understood as devices to facilitate the bargaining process rather than as rational bases for finding "true" costs. The resource costs of a given program as seen by the management of an academic health center, what might be called "dean's cost," are the add-on costs plus the part of the joint costs of the program that cannot be recovered from the sponsors of the remaining programs.

The following example may give some notion of the potential dimensions of the joint-cost bargaining problem. According to effort reports prepared by the faculty of one of the schools in our sample, the level of effort in patient care was such that 31 percent of total faculty time would have been required to maintain that output if all the other programs—education, research, administration—of the school had been eliminated. If we assume that patient care hours are paid for at the same rate as hours spent in other activities and the price of time spent in patient care is the same for academic and nonacademic physicians, then 31 percent of total faculty salaries would have been funded from patient care sources if the sponsor had paid for both the joint and the add-on costs of this activity. Yet, if faculty responsibility for patient care had been eliminated and only that part of their effort required to meet education and research objectives had been demanded, total faculty effort would have been reduced by only 12 percent. If patient care had been fully funded (joint costs and add-on costs) according to the above assumptions, its elimination would have resulted in a decrease of 31 percent in school revenues but only 12 percent in school costs. Put in another way, if the sponsors of the professional component of patient care had not been willing to fund that activity on the same basis as if it were being provided in a nonacademic setting—if they had been willing to cover only the add-on costs rather than the add-on plus the joint costs—the school administration would have had to find a new source of funding for 19 percent of its faculty salary budget.

This example is in many ways unrealistic and extreme, but it illustrates the degree of complementarity among many of the programs in academic health centers and the sensitivity of the perceived cost of the core activity—education—to the levels of funding of research and patient care. Speaking very generally, the balance of bargaining forces results in the "dean's cost" of education programs approximating the add-on costs of those education programs plus a large fraction of the joint costs of education and research. Sponsors of patient care programs are generally expected to cover the costs of starting those programs from scratch—the joint costs of education and patient care.

There are some very important exceptions to these general tendencies. Although there is a presumption that patient care should fully fund itself, the conditions of the market in which a particular academic health center supplies patient care may make that infeasible. The academic health center may be competitively weak relative to the local nonacademic health community so that most of the patients channeled to the academic health center are not sponsored by a third-party payer. Or third-party sponsors may refuse to cover the total costs in the academic health center. The likelihood of dependence on unsponsored patients has been reduced enormously by Medicare and Medicaid, but this situation still obtains for a few academic health centers operating in areas where the supply of nonacademic physicians is relatively abundant and the hotel services of the teaching hospital are not competitive with those of the nonteaching hospitals. The more over-bedded and over-doctored (or less under-doctored) the community the less likely it is that the academic health center will recover the total professional cost of the patient care

program and hence the greater the "dean's cost" of the education program. The extent to which this is true will also be a function of the structure of the education program. In particular, specialties that provide a relatively larger share of care in out-patient than in in-patient settings—roughly speaking, the primary care services —will find it difficult to recover all of their joint costs of education and patient care from patient care sponsors.

The bargaining over joint costs between academic health centers and the sponsors of research programs is rather more complex and the likely outcome difficult to describe. Most of the direct expenditures on research support add-on costs, even when these direct expenditures cover faculty salaries. The actual end-use of such funding may well be additional research personnel or additional research space and equipment. Or the very existence of the faculty position being funded may be contingent upon the salary support of research sponsors. In either case the funding is being used to cover add-on costs of the research program. Sponsors of research are financing the joint costs of education and research in underwriting faculty salaries only if the resource purchases of the academic health center are unaffected by this support.

Joint costs may be paid for by research sponsors through indirect or overhead charges, however. Although the accounting formulae used to establish the size of these charges purport to measure add-on costs, many if not most of the resources funded in this fashion would have been purchased by the recipient institutions even without such support. That is, they are joint costs. An important complication here, however, is that the academic health centers may not actually get to use these funds. Indirect research support funds are likely to accrue to the general ledger account of the university of which the academic health center is a part or, in the case of public institutions, to the general fund of the state. From the point of view of the administration of the academic health center, the fact that research sponsors have implicitly agreed to support certain of the joint costs of education and research thus may be quite irrelevant. The "dean's cost" of the education program will include most of the joint costs of education and research unless he is able to establish a budgetary linkage between the receipt of research-overhead funds by the university or state and the allocation of funds to the academic health center.

The major reason why health manpower legislation and other federal health policies are complexly interdependent is because the allocation of responsiblity for support of joint costs is the result of an ad hoc bargaining process. Most of the specific research, patient care, or education programs in academic health centers that are sponsored by the federal government have been funded at some intermediate level between the two extremes of add-on costs and the cost of starting from scratch. They have been costed so as to bear some proportion of the joint or unallocable costs of the academic health center. If such a program is cut back or eliminated, the surviving programs will be required to assume a larger share of joint costs. It is in this sense that the costs of the remaining programs are perceived as being increased. There need be no presumption that the program being phased out was excessively funded nor that the affected institution has not released all the resources that were strictly allocable to the eliminated program. The disappearance of the funding of a given program will result in an increase in the cost of the education program as perceived by the administration of an academic health center so long as the eliminated program was funded on a basis more generous than the concept of add-on cost.

Differences in the Price of Inputs

Strictly speaking, up to now we have been talking only about resource costs. As

seen by the academic health center, the cost of the teaching program is the cost of the add-on resources required for teaching plus that part of the cost of the resources jointly used with research and patient care programs not covered by the sponsors of those programs. But the administration of an academic health center is really concerned about dollar costs or funding requirements. If the price of a given resource were the same in each program, statements about resource costs would be equivalent to statements about money costs. But this assumption about the equality of input prices across programs does not hold. In particular, the price of M.D. professional time varies greatly between education programs and patient care programs. The price of professional time in patient care is given from outside the academic health center by the "usual and customary" fee structure that has emerged for the patient care market as a whole. These prices vary enormously from specialty to specialty. The price of professional time in education is determined inside the academic health center through a series of individual bargains between the center administration and members of the faculty. These prices also vary enormously from individual to individual and from specialty to specialty, but they have one thing in common. They tend to be less than the price received by that individual for time devoted to remunerated patient care. Indeed, in certain cases the price of professional effort in education is actually negative.[1]

The difference between the price of teaching time and that of patient care time is evident both in the low absolute salaries to part-time clinical teaching faculty and in the low proportion of the total income of geographic-full-time faculty that is derived from the academic health center budget—a proportion that is generally lower than the proportion of total working time devoted to academic activities. For strict-full-time faculty this difference is evident in the fact that the proportion of the salary not covered by practice income tends to be smaller than the proportion of total working time not spent in patient care. These phenomena, and the existence of a large amount of voluntary (donated) teaching, attest to the willingness of many physicians to trade off income over a certain range for the opportunity to pursue teaching and research. The maximum "price" in terms of forgone income that can be exacted of the faculty for this "privilege" is a function of how much time for teaching and research is implied by faculty status, the total required work load (teaching, research, and patient care), and the price of time spent in patient care activities.[2]

The "price" in terms of forgone income that the administration of an academic health center will attempt to extract from an individual faculty member (and hence the price the center is willing to pay for teaching time) is a function of the total work commitment by that individual, the proportion of that commitment that involves teaching, the price of patient care time, and the supply of funds available for the

[1] A physician employed on a strict-full-time basis who generates professional fees (transferred to the school) in excess of his salary can be said to be supplying teaching time at a negative price.

[2] For a given total work load and given price of patient care, this "price" will tend to be greater the greater the proportion of time that can be allocated to teaching and research. For a given total work load and given allocation of that work load between academic activities and patient care, the maximum "price" in terms of forgone income that can be extracted from a faculty member is greater the greater the price of time devoted to patient care if the usual assumption about the diminishing marginal utility of income holds. Neither argument establishes a relationship between the variable in question and the price of teaching time, however. Whether the increase in the "price" faculty are willing to pay at the margin in order to have more time for teaching and research is sufficient to imply a lower price of teaching time is indeterminate. That depends on the individual's relative taste for income and the teaching "privilege." It is also indeterminate whether the increase in the maximum "price" faculty are willing to pay at the margin to maintain a given teaching "privilege" when the price of patient care rises is sufficient to imply a lower price of teaching time. That depends upon how rapidly the marginal utility of income decreases with added income.

support of the education program.[3] In arriving at this set of bargains the administration must satisfy two constraints: The total amount of teaching time contracted for must not be less than the amount required by the education program; and the total amount of salary commitments (net of faculty patient care earnings assigned to the academic health center) must not exceed the education budget. These constraints can be satisfied by many different sets of bargains, which differ in terms of the total number of faculty hired, the average total work commitment and the proportion of that commitment involved with teaching, and the proportion of the maximum "price" in terms of forgone income the faculty are willing to pay for the teaching "privilege" that is actually extracted.

In the period before large-scale federal funding of medical education and research, the budget constraint for academic health centers was sufficiently strict to require the center administration to exact something like the maximum income "price" from its faculty. There was heavy reliance on voluntary and part-time teaching, and the strict-full-time faculty was composed of individuals whose private incomes permitted them the luxury of supplying their time at a very low price and of individuals whose personal commitment to teaching and research was so strong that they were willing to pay the very high prices in terms of forgone income that were demanded of them.

The increased flow of federal funds for medical education and research together with the establishment of the Medicare and Medicaid programs and other federal patient care programs changed the bargaining environment enormously. The budget constraints for the academic health centers were relaxed, and the effect of a given allocation of faculty time between teaching and patient care on the price of teaching time changed, particularly in those centers whose competitive position in the local market for health care was weak. This shift in the bargaining environment resulted in a substantial change in the set of bargaining agreements. At one level these changes can be described in terms of decreased reliance on voluntary and part-time faculty, an increase in the ratio of the number of full-time-equivalent faculty positions to the number of students, and increased faculty salaries. At another level these changes can be described as a reduction in the "price" in terms of forgone income that the academic health centers demanded of their faculties. Faculty with a strong commitment to teaching and research were offered salaries in excess of their minimum supply price (the minimum price that must be paid to keep them in the academic health center). In addition, physicians were brought into academic medicine whose relative taste for income and the teaching "privilege" generated a minimum supply price for teaching time that was not too different from the price of time in patient care.

[3] For strict-full-time faculty the price of teaching time =

$$p_2 = \frac{y - p_1(1 - \lambda_1)\lambda_2 w}{\lambda_1 \lambda_2 w},$$

where y = academic health center salary,
p_1 = price of patient care time,
λ_1 = proportion of working time spent in teaching or research,
λ_2 = proportion of potential working time actually worked, and
w = potential working time (a fixed parameter).

The patient care income generated by the faculty member and assigned to the school is $p_1(1 - \lambda_1)\lambda_2 w$. The potential income in private practice = $y^* = p_1\lambda_2^* w$, where λ^*_2 is the proportion of potential working time actually worked if the individual chooses such a career. The "price" in terms of forgone income that the academic physician pays for the "privilege" of teaching is thus $(y^* - y) = (p_1\lambda_2^* w - y)$. If $\lambda^*_2 = \lambda_2$, then the price of teaching time = $p_2 = p_1 - (y^* - y)/\lambda_1\lambda_2 w$. Conversely, the income "price" can be expressed as a function of the price of teaching time. That is, $(y^* - y) = (p_1 - p_2)\lambda_1\lambda_2 w$.

Recent changes in federal policies have reversed this trend. The budget constraint has become more stringent, and the administrations of most academic health centers have responded by negotiating bargains with their faculty that either exact a higher proportion of the "price" the faculty is willing to pay for a given teaching "privilege" or change the meaning of that privilege by requiring a larger commitment to remunerated patient care. In either case the effect of these new bargains is to reduce the price the academic health center pays for teaching time.

There are several bargaining strategies the administration of an academic health center may adopt in an effort to reduce the price of teaching time. It may attempt to shift faculty from strict-full-time to geographic-full-time status and offer a new salary that is less than the difference between the old salary and the practice income formerly assigned to the center. It may institute a faculty practice plan that ties strict-full-time salaries to practice earnings and assigns earnings quotas that will result in an increase in the flow of practice earnings to the center. Or it may establish a tax or increase an existing tax on the patient care earnings of geographic-full-time faculty.

These shifts may or may not imply a change in the total teaching time supplied by the individual faculty member. The response of the individual may be to increase his total working time, refuse to change his work habits (in which case he or she will suffer a diminution of income), reduce the proportion of working time devoted to teaching, or leave the academic health center for private practice or another center where the income "price" demanded for a given teaching "privilege" is smaller. On the average, however, these new bargains will imply a reduction of the teaching time supplied by the individual faculty member and hence an increase in the number of full-time-equivalent faculty necessary to meet the teaching requirements of a given education program. The individuals so affected will attempt to compensate for this reduction in the value of the teaching-research "privilege" by demanding higher salaries. Whether they will be successful in this attempt depends on the stringency of the academic health center's budget constraint.[4]

One further characteristic of the difference between the price of teaching time and the price of time devoted to patient care that deserves attention is the pattern of this difference across clinical specialties. In general, the higher the price of patient care time in a given specialty the lower the observed (agreed-upon) price of teaching time. The price of teaching for sub-specialists who focus on tertiary care problems or physicians in specialties oriented to physical procedures tends to be much lower than the price of teaching time for faculty in what might be called the primary care specialties.

The implication of this variation in input prices across programs for the funding requirements of academic health centers is threefold. First, the funding requirements of medical education programs are a smaller proportion of total institutional funding requirements than the resource costs of that program are of total institutional resource costs. A measurement of the cost of education based on resource requirements—for example, the proportion of total professional effort required for the education program (either as an add-on or as if starting from scratch)—will therefore tend to overestimate the funding requirements of that program.

Second, the ratio of the funding requirements to the resource requirements of the various elements of the education program will vary markedly. Paradoxically, program elements that utilize professionals whose price of time devoted to patient

[4] If λ_2 does not change, the price of teaching time for strict-full-time faculty will fall if $\Delta y/y < (1 - y^*/y)(\Delta\lambda_1/\lambda_1)$, where λ_2 is the proportion of potential working time actually worked, y is salary, y^* is potential income in private practice, and λ_1 is the proportion of working time spent in teaching or research.

care is high will tend to have funding requirements that are low relative to their resource requirements. This relationship between funding requirements and resource requirements exhibits many of the same characteristics as the relationship between dean's cost and add-on costs. Programs stressing training in specialties oriented to tertiary in-patient care and physical procedures will have lower funding requirements than training programs in the primary care specialties or training in an out-patient setting. Programs stressing training in primary care that are staffed with professionals whose private patient care effort is focused on tertiary medicine are likely to generate lower funding requirements than programs of equivalent objective that are staffed with professionals whose private patient care effort is oriented to the provision of primary care.

Third, the funding requirements of education programs of given output are subject to a certain degree of manipulation by the administration of the academic health center. This manipulation can take the form either of changes in the faculty mix by clinical specialty or of changes in the extent to which the administration exercises its monopsony power in bargaining with the faculty. The administrations of most of the schools in our sample are currently succeeding in bargaining for a lower average implicit price of teaching time and hence lower funding requirements for their education programs. This tendency to exercise previously unused monopsony power will continue in the near future, but it will become progressively more difficult to reduce education funding requirements through these means as the income "price" exacted of the faculty approaches the maximum price they are willing to pay.

It is important to understand that these changes in the outcome of the bargaining between administration and faculty have in many cases meant a reduction in the proportion of faculty time devoted to teaching and hence an increase in the number of faculty needed to meet teaching resource requirements. This paradoxical tendency for cost reduction efforts to result in increased faculty-student ratios parallels the equally paradoxical tendency of cost reduction efforts to result in increased average faculty "salaries."[5] The thrust to reduce the implicit price of teaching time has resulted in both an increase in the proportion of time devoted to patient care (and hence total faculty earnings) and a bias toward the employment of clinical faculty with strong earnings opportunities. The outside observer is likely to infer that an increase in the budget of an academic health center resulting from higher salaries and a larger number of faculty signifies yet another in the long series of increases in the cost of medical education. In fact, he may simply be observing the consequences of a successful attempt by the administration of that center to reduce the funding requirements of the education program by bargaining for a lower implicit price of teaching time.

THE EFFECTS OF CHANGES IN FEDERAL HEALTH PROGRAMS AND POLICIES ON THE FUNDING REQUIREMENTS OF UNDERGRADUATE MEDICAL EDUCATION

The large increase in federal outlays for research and patient care in the 1960s not only resulted in a marked increase in research activity and better medical care

[5] "Salary" in this sense means the sum of contractual payments (salary proper) and retained earnings from patient care. The wide variations among schools and among individual faculty members in a given school in the nature of the contractual agreement over salary proper make inferences based on salary data particularly treacherous. High contractual payments for clinical faculty tend to imply a high

for the aged and the poor, it also resulted in a substantial shift of support of the joint costs of academic health centers from the general funds of such institutions (state support, endowment and gifts, tuition, intra-university transfers) to the federal budget. Changes in federal programs and policies are now under way or are planned that will reverse this process. That is, certain of the resources formerly funded by federal research, patient care, or graduate education dollars (and jointly utilized in both the target objective and in undergraduate medical education) must be funded from other sources, or the current level of output of undergraduate medical education, or its current content, cannot be sustained.[6]

The federal program or policy changes that will likely have the most important effects on the funding requirements of undergraduate medical education programs are the phasing down or elimination of graduate training programs, the projected change in Medicare reimbursement rules, the establishment of direct controls over hospital prices, the projected shift from federal to state control of the Children and Youth and Maternal and Infant Care Programs, and the reallocation of research funds among the various National Institutes of Health. Since we are concerned here with changes in *funding requirements* for undergraduate medical education, it is not sufficient simply to consider the effects of these policy changes on the total flow of federal dollars to academic health centers. We must also examine the extent to which these flows of funds have been used to support the joint costs of undergraduate medical education programs. A cutback in federal funds to academic health centers is an increase in the funding requirements of undergraduate medical education programs only if some portion of those funds supported joint costs of those programs.

Reallocation of Research Funds

Although the pattern of fiscal pressure resulting from the reallocation or cutback in research funding will vary substantially among academic health centers, the funding requirements for education programs in most schools will probably not increase noticeably from these changes. The possible exceptions to this argument are private centers that have not been able to establish a strong tradition of research excellence. In spite of the increasing tightness of research funds, the flow of research dollars to schools that have been major centers of research has not tended to decline. Although there has been no marked change in the distribution of research funds across academic health centers, such change as has taken place has apparently worked to the disadvantage of those centers traditionally least committed to research. The additional argument that private schools appear most likely to suffer some increase in funding requirements for education programs because of the reallocation of research funds follows from our finding that federal payments of research overhead expenses—the main potential source of research support of joint costs involving education programs—are less likely to accrue directly to public academic health centers than to private centers.

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proportion of time spent in patient care. But then so do low contractual payments. In the former case professional fees are assigned to the academic health center; in the latter, the fees are retained (at least in part) by the individual faculty member.

[6] This is not to say that the changes in federal policies or programs under discussion are not sound. Each of these changes has its own rationale, and if they are to be responsibly criticized they must be examined in a total context. Our only point is that these changes have side effects on the funding requirements of undergraduate medical education programs in academic health centers that ought to be considered when the Health Manpower Act is re-examined.

Changes in Direct Federal Health Care Programs

Projected changes in direct federal health care programs—Children and Youth, Maternal and Infant Care, Community Mental Health, and the Regional Medical Programs—also imply small increases in the aggregate funding requirements for undergraduate medical education. The effect on the funding requirements of specific departments in specific academic health centers will be important, however. For the particular sample of schools we have examined the most important of this type of change is the projected transfer of the Children and Youth and Maternal and Infant Care Programs from federal to state control. In one of the centers of our sample this change was expected to result in a serious reduction of funding for clinics operated by the departments of Obstetrics/Gynecology and Pediatrics and hence a very large reduction in the support of the joint costs of education and patient care. Given the disadvantageous competitive position of this academic health center in the local health care market, there are no foreseeable sponsors of patient care to take up the budgetary slack in the short run. We suspect that the funding requirements of the education programs of this academic health center will increase by an amount that is somewhat more than half of the projected decrease in flow of funds to the direct health care programs.

Reduction of Research Training Grants

The change in federal policy probably having the greatest current effect on the funding requirements of undergraduate medical education is the phasing down or elimination of the research training grant programs. Any quantitative estimate of this increase at this time is little more than a guess, however, since academic health centers have just begun to make the budgetary adjustments that this change in federal policy will ultimately require. For that matter, the magnitude of the reduction in the flow of funds to this program is itself still uncertain. All that can be said at this time is that the training grant programs appear to have been funded on a basis that was considerably more generous than that of add-on cost. Many of these funds supported resources used jointly in undergraduate and graduate medical education. The extent to which training grants were used to fund joint costs of undergraduate education relates to the extent to which they were used to support faculty salaries as opposed to graduate stipends, but this tendency can easily be overdrawn. Graduate medical students (house staff) are an important source of inputs into undergraduate clinical-education programs, and a reduction in the number of house staff resulting from a closing out of training grant programs is likely to generate an increase in requirements for clinical faculty. This problem will probably be most acute in the field of psychiatry, for many training programs in this area were explicitly oriented to clinical graduate education as opposed to research.

The Projected Change in Medicare Reimbursement Rules

The effect of the projected change in Medicare professional reimbursement rules on the funding requirements of undergraduate medical education is also difficult to quantify. In this case, however, the major difficulty is estimating the reduction in flow of federal dollars implied by the policy shift rather than estimating the extent to which a given reduction in flow of federal dollars will imply an increase in funding requirements. In the schools we have examined it appears that a shift in Medicare professional reimbursement in nonprivate settings from a fee to a cost basis would result in an increase in the funding requirements of education programs by an

amount approximately equal to the reduction in flow of federal funds that such a policy change would entail. The proposed revisions in reimbursement rules would result in no change in the role of faculty in patient management. There would thus be no change in the resource requirements of academic health centers so affected. There would simply be a reduction of patient care income and a concomitant increase in the funding requirements for the education program.

What is at issue here is not the responsibility of the Social Security Administration for the support of the joint costs of patient care and research but the basis on which the jointly provided patient care services are to be valued. From the point of view of the Medicare authorities it is incorrect to argue that the proposed revision in reimbursement rules represents a reduction in the support of the joint costs of patient care and education. From their point of view, the revision is perfectly consonant with the assumption that sponsors of patient care should fund the total (joint plus add-on) costs of that activity. The argument of the proponents of the revision is that the existing reimbursement mechanism supports more than total costs of patient care. It supports part of the add-on costs of education.

The counterargument of the academic health centers is that the appropriate basis of valuation of patient care activities is the "customary and usual" fee structure determined in the health care market as a whole. Further, the supply price of professional time in teaching is separable from and lower than the supply price of professional time devoted to patient care. It is at this point that the nature of the conceptual conflict appears most clearly, for the argument of the Medicare authorities is that where the academic health center contracts for strict-full-time faculty, the supply prices of teaching time and patient-care time are identical.

We can offer no basis for resolution of this conceptual conflict. All we can do is point out the consequences to the funding requirements of education programs of adopting the principle that the prices of teaching time and patient care time are identical. The inevitable implication of this principle is that education funding requirements will increase. Further, so long as the fee-for-service basis for professional remuneration obtains in private settings, the strict implementation of this principle would in the long run tend to force medical schools to abandon those teaching programs that have been sited in public hospitals. The costs of reconfiguring these clinical teaching programs in private settings would be large.

The distribution across academic health centers of the change in flow of federal funds entailed by the projected change in Medicare reimbursement rules is very difficult to estimate. Data on patient care income by sponsor for individual faculty members are not generally available. Further, although the rules identifying private and nonprivate settings appear to be reasonably clearly drawn, the application of these rules by the Medicare intermediaries is likely to be unpredictable. The intractability of certain of the accounting problems encountered in establishing a "cost" basis for professional reimbursement suggests that the intermediaries have something of an incentive to find that a particular patient setting is "private" and hence eligible for reimbursement on a fee basis. The only clear inference is that the effect of the projected change will vary widely across academic health centers. Many centers will feel no effect. A few will suffer a large reduction of income and hence a large increase in the funding requirements of their education programs.

Regulation of Hospital Prices

Direct controls over the prices of hospital services need not influence the funding requirements of undergraduate medical education in a major way so long as the size of the clinical teaching program does not change. An academic health center that

is considering an increase in the size of its undergraduate program or has recently increased the size of its entering class, however, is likely to find this funding requirement sharply increased as a result of hospital price controls. The price control system will make it very difficult for hospitals to assume fiscal responsibility for more intensive education programs or new programs. For the hospitals that are an integral part of academic health centers or have been major teaching affiliates this constraint need not be onerous.[7] The expansion of graduate medical education programs in these hospitals since the early 1960s has been sufficiently large that further expansion without a concomitant increase in patient flow is likely to be perceived as threatening the quality of the educational experience. What is a problem is the difficulty of creating new educational programs in hospitals previously unaffiliated with medical schools or expanding programs in hospitals where educational programs have been at a low level.

The majority of the schools in our sample perceive patient flow to be a constraint to further expansion of undergraduate medical education; that is, further expansion, and in some cases maintenance of current levels of undergraduate education, will require either new affiliation agreements or enlargement of existing hospital or clinic facilities. Where the latter is impractical, there will be a conflict between health manpower objectives and price control objectives. Its resolution will require explicit recognition in the regulations of the Cost of Living Council that in certain cases increases in costs of education programs are a valid basis for exception to overall price constraints. The necessity for resolving this conflict will become all the more acute if the proposed revisions of Medicare professional reimbursement rules are carried out, for this change will provide a powerful incentive for medical schools to seek new affiliation agreements with private hospitals and enlarge the teaching programs in those private hospitals where affiliation agreements are currently in force.

Although the direct effect of wage-price controls is primarily to constrain assumption of additional house-staff (graduate education) costs and may thus be thought consonant with federal health manpower objectives, the indirect effect of these controls is also to constrain the expansion of undergraduate education. A major undergraduate program cannot be carried out efficiently in a hospital or clinic without a concurrent graduate program.

It is more difficult to specify those effects of hospital wage-price controls on the funding requirements of the education programs of academic health centers that derive from the fact that medical schools and hospitals are in many instances fiscally integrated. The basic problem here is understanding the basis of decision-making authority and responsibility. For example, although four of the six state schools in our sample can be said to own their major teaching hospital, an operating deficit of the hospital does not directly affect the volume of funds allocated to the medical school. The relationship is indirect and is defined mainly in terms of changes in the outcome of the bargaining over areas of responsibility and prices of internal transactions. In three of these four cases the center hospital has recently operated at a deficit that would have been either reduced or eliminated by price increases in the absence of price controls. In each case some part of that deficit has been shifted to the medical school budget through changes in the prices of transactions between the school and the hospital. In the case of the one private school in our sample that

[7] This is not true for those institutions that have used training grants as a major source of funds for house staff involved in direct patient care. One of the major teaching hospitals in our sample of academic health centers is in this position. It is also not true for those institutions that were in the process of shifting primary responsibility for funding house staff from the medical school to the hospital (to third-party payers and patients) at the time wage-price controls went into effect. Another of the major teaching hospitals in our sample is in this position.

owns its major teaching hospital, any hospital deficit is the juridical responsibility of the health center and would result in a reduced future flow of funds both to the hospital and to the medical school. It is impossible to predict *a priori* how any reduced flow of funds would be apportioned.

The above discussion on the apportionment of operating losses of teaching hospitals between the hospital and the medical school may lead to the conclusion that a major part of the financial difficulty of medical schools results from their support of deficits derived from the hospital component of patient care. For the schools in our sample this conclusion is not warranted. In no case is it clear that funds generated by education or research programs are being used to support the nonprofessional costs of patient care in any important way. The more relevant question is whether sponsors of hospital care are underwriting the add-on costs of graduate or undergraduate medical education programs.

This question is exceedingly difficult to answer. What is really being asked is whether the performance of patient care in a teaching setting means that charges to sponsors of patient care are larger than they would have been had the care been provided in a nonacademic setting.[8] It is not possible to answer this question simply by looking at such accounting items as house staff salaries and instructional payments. Total costs per equivalent medical episode of equivalent care (equivalent outcomes) in teaching and nonteaching settings must be compared, and this is a most formidable task.[9]

Some insight into the question of whether sponsors of hospital care are subsidizing the add-on costs of education programs can be gained by examining the financial relationships between the medical school and the teaching hospital, however. In a small minority of the academic health centers of our sample there are contractual arrangements between the medical school and the hospital that are clearly disadvantageous to the sponsors of hospital care. For example, the medical school may be franchised to operate certain cost centers in the teaching hospital, such as laboratories, that historically have been sources of internal profits used to offset losses on basic nursing and housekeeping services. Such obvious cases for subsidy are not the general rule, however. In most of the academic health centers in our sample the accounting separation between the teaching hospital and the medical school has been made sufficiently "clean" that it is quite impossible to establish with current evidence a convincing argument that sponsors of hospital care are subsidizing education programs. Medicare audits have exerted a certain discipline over this accounting relationship; the impetus to cost reduction given by the price control system has greatly intensified the pressure in this direction. What can be concluded most surely is that if sponsors of hospital care are in fact supporting the add-on costs of education programs, the price control system has worked to reduce the extent of this subsidy and hence has increased educational funding requirements.

[8] If there is a presumption of higher quality care in an academic setting there is the further question of whether the sponsors of patient care are willing to pay the costs of the additional resources (chiefly house staff) required to achieve that increment in quality.

[9] Strictly speaking, what is at issue is the total cost of patient care, not just hospital costs. Since a shift of patient care from a nonacademic setting to an academic setting involves the substitution of hospital-reimbursed resources (house staff) for independent professional resources, the fact that costs of care in teaching hospitals are larger than those in equivalent nonteaching hospitals carries with it no necessary implication that the *total* cost of patient care per equivalent episode is larger. The charges of independent professionals (faculty) may be smaller where care is provided in a teaching hospital.

VIII. FEDERAL MANPOWER PROGRAMS AND INSTITUTIONAL FINANCE

A principal objective of the 1971 Comprehensive Health Manpower Training Act was to assure the financial viability of the medical schools, by providing each institution with a federally guaranteed level of "first-dollar" funding. Assuring financial viability was believed necessary to the success of any program to increase the supply of trained manpower. One important question in drafting the replacement for the 1971 act is how changes in the structure of institutional support may affect the financial position of the schools, particularly since one option is to switch from a program of formula grants to one that offers support through higher tuition payments (financed in part by federal loans and scholarships) and through targeted grant programs. To answer this question, we must first analyze the factors that were related to financial difficulty in the past, at least as measured by participation in the distress grant program. We next discuss how the 1971 act and changes in the distribution of NIH research grants have affected the financial position of the schools. Because obligations to the faculty constitute one of the most important elements in a school's budget, we analyze how department size responds to educational and research responsibilities, and the implications of this relationship for the funding requirements of medical education.

FACTORS AFFECTING FINANCIAL DISTRESS

Understanding the factors that precipitated financial difficulty in the past is a necessary prelude to analyzing how future changes in federal programs may affect the financial position of the medical schools. Table 10 presents a list of variables that we believe, *a priori*, can influence financial status. Most are clearly defined by the table, but X_8 (restricted supply of patients) may require additional explanation. Our work at individual medical schools suggests that heavy reliance on charity patients as a source of teaching material may increase the funding demands made by the hospital on the school and the educational program. Reliance on charity patients, in turn, is related to the hospital's ability to compete in the local health care market. The more medical schools in the area, the smaller the number of teaching patients with third-party insurance the hospital is likely to attract, and the more it will tend to rely on charity patients as a source of clinical material. A restricted supply of patients can be measured by the ratio of population to medical students in the area. If this ratio is low relative to the national norm, we expect that the likelihood of financial distress is increased. For schools below the national mean on this indicator we enter as X_8 the amount by which their ratio differs from the national mean; a higher value of X_8, therefore, indicates a more restricted supply of patients and—possibly—an increased chance of financial distress. For schools above the national mean we enter zero, since we believe this factor is only important for schools with below-normal numbers of patients in the local area.

We wish to test which of the variables in Table 10 were related to financial difficulty in the past, as measured by participation in the distress grant program in FY 1971. That is, we wish to build an index, I, that predicts the size of a distress award, y. If no award was received, $y = 0$. This index will be a linear combination of the variables in Table 10:

Table 10

VARIABLES THAT MAY AFFECT FINANCIAL POSITIONS

Variable Number	Variable Description	How Variable Is Expressed
X_1	Public or private status	X_1 = 1 for state schools X_1 = 0 for private schools
X_2	Use of volunteer faculty	Ratio of volunteer to full time faculty
X_3	Involvement in graduate education	Interns and residents per medical student
X_4	Ability to secure research funding	Fraction of NIH grants approved
X_5	Restricted supply of patients	Max (mean (Z)-Z, 0) where Z is the ratio of the population in the SMSA where the school is located to the number of medical students from all schools in the same SMSA
X_6	Enrollment expansion	Difference between total medical student enrollment in 1970-71 and total medical student enrollment in 1967-68
X_7	Size of medical school education program	Medical school enrollment in 1970-71

$$y = I + \epsilon = \sum_i \beta_i X_i + \epsilon \qquad (1)$$

where ϵ is an error term, assumed to be normally distributed with mean zero and variance σ^2. A variable, X_i, is related to financial distress if its coefficient, β_i, is significantly different from zero. The estimation of (1) must take into account the fact that distress grants can never be negative; that is:

$$y = 0 \quad \text{if } I + \epsilon \leq 0 \qquad (2a)$$

$$y = I + \epsilon \text{ if } I + \epsilon > 0 \qquad (2b)$$

The Tobit model provides an appropriate method of estimation when (1) is constrained in this manner.[1]

The results of the estimation are presented in Table 11.[2] As can be seen, the factors of Table 10 explain only a small part of the variance in FY 1971 financial

[1] For a description of the Tobit model, see James Tobin, "Estimation of Relationships for Limited Dependent Variables," *Econometrica*, 26, 1, January 1958, 24-36. We used a program by Charles Phelps of The Rand Corporation to perform the estimation.

[2] An alternative specification was tried, using distress dollars per medical student as the dependent variable, and omitting X_7 from the list of explanatory variables. In this specification, only the coefficients on X_1 and X_3 were significant, but they had the same sign as in Table 10.

Table 11

FINANCIAL DISTRESS GRANTS ($000) IN FISCAL YEAR 1971

(91 schools)[a]

Explanatory Variables	
X_1 (state/private)	-259.59[b] (9.3)
X_2 (volunteer faculty)	57.43[b] (4.7)
X_3 (graduate medical)	-134.32 (1.7)
X_4 (research)	-943.8[b] (5.8)
X_5 (patient supply)	0.12[b] (4.6)
X_6 (expansion)	-1.55 (2.4)
X_7 (medical students)	-0.34 (1.8)
Proportion of variance explained	0.29

Numbers in parentheses are χ^2 values with 1 degree of freedom.

[a]Excludes the three schools with largest awards; these appear to be outliers (Albert Einstein, Georgetown, and George Washington).

[b]Significant at 5 percent level.

distress awards.[3] Financial difficulty was more likely for private schools, schools with weak research programs, and schools facing substantial competition for patients. It also appears that financial difficulty was more likely for schools with a high proportion of volunteer faculty, but this may be a result rather than a cause of financial distress: Schools in financial difficulty may try to minimize their faculty budget requirements by relying on donated time from local clinicians. The most striking aspect of Table 11 is the variables that are not significant: There appears to be no relationship between financial difficulty in the past and any of the variables that measure educational outputs (X_1, X_6, and X_7). Therefore, although relieving financial distress may have been necessary to sustain the expansion of medical training, that objective was not the cause of financial difficulty. Rather, to the extent that we can explain financial distress, it seems to be related to underlying factors that are hard to change in the short run. These factors will still be present even if the objectives of federal manpower policy are quite different from what they have been in the recent past.

[3] The proportion of variance explained is measured by one minus the ratio of the mean square error of the prediction to the variance of the dependent variable and is directly analogous to the R^2 of ordinary regression.

CHANGES IN THE FLOW OF FEDERAL FUNDS TO MEDICAL SCHOOLS [4]

Academic health science centers receive significant federal support for all three of their principal activities: teaching, research, and patient care. Including construction funds, about $200 million a year is received in support of undergraduate education. Federal support of research activity runs approximately $600 million per year, mostly in NIH research grants. No good estimates are available on the volume of support for clinical activity, but it easily exceeds $1 billion per year—mostly provided by the Veterans Administration, Medicare, and Medicaid. The flow of federal support for teaching and research represent significant elements in the school budget (as opposed to the center budget), and it is important to understand how these two flows have changed in order to analyze the effects of future federal programs.

Programs Supporting Pre-M.D. Education

Table 12 summarizes the flow of funds to medical schools from the federal government's programs of support for pre-M.D. education.[5] These funds now represent a significant share of total federal support of medical schools. To a certain extent, the increased support for physician training offsets the relative stagnation of research funds, although pre-M.D. training still provides less than half as much support as research grants, and only one-fourth as much if construction funds are excluded from the total. Nonetheless, the development of institutional programs has shifted the balance of federal assistance. Because institutional support is managed by the central medical school administration, and research funds generally belong to departments and individuals, this change has also shifted the locus of budgetary authority within the medical schools, giving greater control to the central administration.

Viewed over the entire period of federal involvement, construction grants form the largest single element of institutional assistance. However, operating support funds have been growing rapidly, especially with the introduction of capitation (FY 1972). Capitation was intended to replace financial distress grants. With capitation, only limited funds are available for financial distress awards, and eligibility is more tightly controlled. One effect of this change is to shift the distribution of federal funds among medical schools. Whereas only schools in financial need could qualify for a distress grant, any school can receive capitation if it meets the enrollment expansion requirement. Although overall operating support doubled between FY 1971 and FY 1972, operating support for schools in financial distress increased by only one-half. In contrast, operating funds for nondistress schools increased two and one-half times (Table 13). Although no school lost funds from the shift, capitation changed the distribution of federal funds in favor of the nondistress schools at the expense of the distress schools.

Table 13 also indicates how the distress schools responded to the expansion of programs providing operating support. It focuses on fiscal years 1971 and 1972, because between these two years there was a sharp increase in both the funds available and the variety of programs supported. Of particular interest is the partici-

[4] The analysis presented here is based on aggregate data. We are in the process of collecting extensive detailed data on departmental budgets of the 10 schools in our sample, and analysis of these data will be presented in later reports.

[5] Table 12 excludes awards for Area Health Education Centers, teacher training, and family practice training. Data for this and succeeding tables were furnished by the Bureau of Health Resources Development, Health Resources Administration, DHEW.

Table 12

FLOW OF FUNDS TO MEDICAL SCHOOLS FOR UNDERGRADUATE EDUCATION
($ million)

Grant Program	FY 65	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71	FY 72	FY 73
Basic improvement/capitation		6.6	18.8	20.2	21.1	21.3	21.8	90.2	95.9
Enrollment increase					.5	12.3	23.6	25.6	21.4
Shorten curriculum					.4	.6	1.4	3.8	2.1
Financial distress				5.5	19.0	22.0	30.2	6.6	5.8
Other special projects								11.4	5.5
Start-up assistance								2.2	
Conversion assistance								2.5	6.3
(Total operating support)		(6.6)	(18.8)	(25.7)	(41.0)	(56.2)	(77.0)	(142.3)	(137.0)
Loans	6.6	9.8	14.2	14.7	14.2	8.4	13.1	15.9	19.5
Scholarships			1.8	3.3	5.3	7.3	7.1	7.2	6.8
(Total loans and scholarships)	(6.6)	(9.8)	(16.0)	(18.0)	(19.5)	(15.7)	(20.2)	(23.1)	(26.3)
Construction	53.8	42.5	91.0	79.4	93.1	102.1	61.8	86.0	
Total manpower support	60.4	58.9	125.8	123.1	153.6	174.0	159.0	251.4	163.3

Table 13

FEDERAL OPERATING SUPPORT TO FINANCIAL DISTRESS
AND NONDISTRESS SCHOOLS[a]

	Distress Schools[b]				Nondistress Schools[c]			
	Number		$ Million		Number		$ Million	
Program	FY 71	FY 72	FY 71	FY 72	FY 71	FY 72	FY 71	FY 72
Financial distress	60	4	25.7	2.9	--	--	--	--
Institutional grants/ capitation	60	60	12.6	51.9	46	46	8.7	35.5
Enrollment increase	30	33	12.3	13.3	23	25	10.0	10.6
Shorten curriculum	1	9	.1	1.8	7	9	1.3	2.0
Other special project grants	--	39	--	7.5	--	28	--	3.6
Total operating support	60	60	50.7	77.3	46	46	20.0	51.8

[a]Excludes start-up and conversion assistance.

[b]Excludes George Washington and Georgetown Universities because of the special circumstances surrounding their financial distress grants. Were these included, total FY 1971 support would be $57.0 million, and FY 1972 support would be $85.2 million.

[c]Excludes five schools ineligible to receive an institutional grant in FY 1971 (all new schools).

pation of financial distress schools in the program of grants to increase enrollment. Distress schools did not attempt to gain a larger share of federal funds by increasing enrollment—at least no more so than nondistress schools. The number of schools receiving enrollment increase grants did not change appreciably between FY 1971 and FY 1972, and the proportion of distress schools receiving such grants was almost exactly the same as the proportion among nondistress schools. Thus, not only was distress status unrelated to enrollment expansion before the 1971 act (Table 11), but it remained unrelated even as the federal government continued to press for expansion of pre-M.D. training.

There was a sharp increase in interest among distress schools in programs to shorten the curriculum. In addition, the distress schools succeeded in securing a larger share of other special project grant funds. According to Table 13, the average award of other special project grant funds to a distress school was considerably larger than to a nondistress school, indicating that the distress school either applied for a larger award for a single purpose or applied for more purposes than did the typical nondistress school. However, the amount of funds involved in these programs was not large enough to have a significant effect on the relative distribution of federal funds.

Table 14 reaffirms what we found in our analysis of the factors related to financial difficulty: that private schools were more likely to be in distress than state schools, and that the typical private school received a much larger distress award. The shift of institutional support from the distress grant to the capitation program, therefore, dramatically changed the distribution of federal funds between state and private schools. Whereas state and private schools received approximately the same amount of such funds in FY 1971, in FY 1972 state schools as a group received 25 percent more than did the private schools. Thus one of the effects of the capitation program has been to increase the "federal" character of the state schools. The

Table 14

FEDERAL OPERATING SUPPORT TO PRIVATE AND STATE SCHOOLS[a]

	Private[b]				State			
	Number		$ Million		Number		$ Million	
Program	FY 71	FY 72	FY 71	FY 72	FY 71	FY 72	FY 71	FY 72
Financial distress	30	4	16.2	2.9	30	0	9.6	0
Institutional grants/ capitation	45	45	9.5	37.9	61	61	11.9	49.5
Enrollment increase	20	23	7.4	10.3	33	35	14.8	13.6
Shorten curriculum	3	6	.8	1.5	5	12	.6	2.3
Other special project grants	--	29	--	4.9	--	38	--	6.5
Total operating support	45	45	33.9	57.5	61	61	36.9	71.9

[a]Excludes start-up and conversion assistance. Also excludes five schools ineligible to receive an institutional grant in FY 1971 (all new schools).

[b]Excludes George Washington and Georgetown because of the special circumstances surrounding their financial distress grants. Were these included, total FY 1971 support would be $40.2 million, and FY 1972 support would be $65.4 million.

typical state school now receives about as much federal operating support as does the average private school—whereas in FY 1971 it received 20 percent less.

NIH Research Funding

Our analysis of the factors underlying financial difficulty in the past indicated that schools with weak research programs were more likely to find themselves in distress. It is therefore important to understand how the distribution of NIH research grants has been changing, especially since there has been substantial year-to-year variation around a basic trend of slow growth (relative to the 1950s and early 1960s). Table 15 shows the total dollars awarded each year to the 93 four-year medical schools that graduated a class in June of 1973 (Puerto Rico is omitted).[6] Among these 93 medical schools, seven were founded since 1966;[7] a few of these new schools rapidly built up faculties capable of winning NIH grants. The column headed "New Schools" shows the rapid growth in awards to these schools, but by 1973 they still accounted for only 3.2 percent of NIH awards.

There appears to have been no lessening of concentration in NIH grants over the period FY 1967 to FY 1973. The 14 medical schools that received the most NIH dollars in 1967 also received the most NIH dollars in 1973 (although not in every year in between). These 14 schools have managed to increase their total share slightly during the period. The difference between the top 14 schools and the other schools is shown more dramatically in Table 16, which gives the annual rates of increase in NIH grants. The percentage increase in awards to the top 14 schools from 1967 to 1973 has been almost twice as great as the percentage increase received by the other 72 schools founded before 1966. Thus this period has seen a slight shift in the distribution of NIH research funds in favor of the schools that were already heavily involved in research.

At the same time that concentration of research awards has been increasing, renewal grants have been receiving more favorable priority scores[8] from the NIH study sections, whereas priority scores for new grants have remained unchanged (Table 17).[9] This immediately raises the question whether there is a bias in the peer review process that favors the established investigator. This is one of two alternative hypotheses:

1. The study sections are in fact becoming anxious about funding grants to those who have proven track records and may, perhaps unconsciously, award them better scores than they would have received for an application of the same relative merit at an earlier time.
2. With the declining effective funding levels of NIH, the average quality of funded grants is increasing over time, since those at the bottom end of the scale are not

[6] Data on research grants in this section are taken from the NIH IMPAC file, a machine-readable file whose full title is Information for Management Planning Analysis and Coordination.

[7] University of Arizona; University of California at Davis; University of California at San Diego; Michigan State; Pennsylvania State; University of Texas, San Antonio; and University of Louisiana at Shreveport.

[8] Priority scores are measures of the "scientific merit" of a proposal, awarded by study sections of NIH, composed of scientists drawn from the research community. Lower scores are better than higher scores (that is, 100 is better than 200).

[9] An analysis of variance shows that the effect of year is not significant at the 0.10 level for new applications but is significant at the 0.001 level for renewal applications. Table 17, and the subsequent discussion of new versus renewal grants, is based on applications to the 47 Division of Research Grants study sections from medical schools and hospitals that are "major affiliates" of medical schools. The analysis is confined to applications recommended for approval.

Table 15

NIH RESEARCH AND TRAINING GRANTS AWARDED TO 93
U.S. MEDICAL SCHOOLS

(All awards in millions of dollars)

Fiscal Year	Total Awards	New Schools		Top 14		Remaining 72 Schools	
		Awards	%	Awards	%	Awards	%
67	415.8	1.0	0.2	167.5	40.9	247.3	58.9
68	429.9	3.9	0.9	175.7	40.9	250.3	58.2
69	440.6	7.6	1.7	181.3	41.2	251.7	57.1
70	420.0	10.3	2.5	175.5	41.8	234.2	55.7
71	467.8	15.2	3.2	196.1	41.9	256.5	54.9
72	540.8	17.6	3.3	230.3	42.6	292.9	54.1
73	518.6	16.8	3.2	226.0	43.6	275.8	53.2

Table 16

RATES OF INCREASE IN NIH GRANTS AWARDED TO 93
MEDICAL SCHOOLS

Fiscal Year	From Preceding Year			From 1967		
	All Schools	Top 14	Remaining 72	All Schools	Top 14	Remaining 72
68	3.4	4.9	1.2	3.4	4.9	1.2
69	2.5	3.2	0.6	6.0	8.2	1.8
70	-4.7	-3.2	-7.0	1.0	4.7	-5.3
71	11.4	11.7	9.5	12.5	17.1	3.7
72	15.6	17.4	14.2	30.1	37.5	18.4
73	-4.1	-1.9	-5.8	24.7	34.9	11.5

Table 17

AVERAGE PRIORITY SCORE

Grant	Fiscal Year					
	1968	1969	1970	1971	1972	Total
New	242.7	239.8	242.3	239.7	244.5	241.9
Renewal	240.6	232.2	233.3	227.4	223.2	231.4

funded. Consequently, the grants that appear for renewal each year represent more meritorious projects, and the judgments of the study section reflect this.

We can discriminate between these hypotheses by examining the score received on a renewal application, X_2, while controlling for the score received by the same grant the previous time it was reviewed and funded, X_1. For any one grant, these two scores should not be the same because of the uncertainty involved in any research enterprise.[10] To distinguish between our two hypotheses we are interested in the average of the difference $X_2 - X_1$.[11] If the difference is significant and negative, the second hypothesis is rejected. If it is not significant, or if it is significant and positive, the first hypothesis is rejected.

For analysis we divided these pairs of priority scores into two categories, depending on whether X_1—the score on the earlier application—came from a new application or from a renewal application. Within this basic division we further separated the grants according to the year in which the earlier application was acted on. Thus the first line of Table 18 reports on renewals of grants that were *first approved and funded* in FY 1967, the second line reports on renewals of grants that were first approved and funded in FY 1968, and so on. The fifth line of the table reports on renewals of grants that were *previously renewed* in FY 1967, the sixth line reports on renewals of grants that were previously renewed in FY 1968, and so on. The table presents average priority scores, denoted $\bar{X}_1$ and $\bar{X}_2$. For the computation of the differences we used a corrected value of $\bar{X}_1$, labeled $\bar{X}_1$ "true score" in Table 18.[12] In only one out of the eight cases is the average score on the second application better than the estimated score on the earlier application, and that is in 1969 when both are renewal applications (line 7 of Table 18). In addition, the effect of year on X_2 closely follows the effect of year on X_1. Thus, the trend in the priority scores received on renewal applications can be explained fully in terms of the improvement in the average quality of the grants appearing for renewal.

The column headed ρ in Table 18 gives the correlation coefficient between X_1 and X_2. In all cases it is quite low indicating that X_2 cannot be predicted very well from X_1. This small correlation coefficient between the renewal and original grant scores implies that the study section judgments involve not only the individual performing the research but also the particular project at that time. Even a project returning to competition for the third or more time may have a score quite different from the ones it received previously. Even these grants, presumably from well-established investigators, are examined quite critically.

Our analysis indicates that the integrity of the peer review system has withstood

[10] Between the two peer judgments, the investigator may have produced evidence to show his approach is more promising than the study section had first thought, or he may have been able to make much less progress than hoped for. Discoveries in other areas of research may alter perceptions about which areas are most important to pursue and which are most likely to succeed. In addition, there is the problem of the error of measurement in each priority score; that is, a study section composed of different people reviewing the same application at the same time would have produced a slightly different priority score.

[11] Since the X_1 come only from funded grants, there is a bias in our estimate of X_1, because the errors made in measuring these scores are more likely to have resulted in lower scores. If we knew p, the reliability coefficient of the priority score, our best estimate of the average "true score" (the score that would have been received if the applications had been reviewed by all possible study sections) is given by:

$$\text{"True score"} = p\,\bar{X}_1 + (1 - p)u$$

where u is the average score received by *all* grants of the same type. In our analysis we used $p = .90$, which is within the range of reliability coefficients found in J. Palmer Saunders and Mordecai H. Gordon, "NIH Study Section Ratings: Scientific Merit or Order of Payment," National Cancer Institute, 1965 (unpublished). However, these results are not very sensitive to the exact choice of p.

[12] See footnote 11.

Table 18

RENEWAL SCORE COMPARED WITH SCORE ON IMMEDIATELY PRECEDING COMPETING APPLICATIONS

Type and Year of First Application	Number of Samples	ρ	$\bar{X}_1$	$\bar{X}_1$ "True Score"	$\bar{X}_2$	$\bar{X}_2 - \bar{X}_1$ "True Score"	Standard Deviation of Distribution of Differences
$\bar{X}_1$ is a new application							
FY 67	408	0.36	217.3	219.9	230.0	10.1	76.0
FY 68	311	0.43	200.9	205.0	222.2	17.2	67.0
FY 69	342	0.36	202.6	206.3	224.0	17.7	71.4
FY 70	217	0.34	191.7	196.8	221.2	24.4	66.9
$\bar{X}_1$ is a renewal application							
FY 67	386	0.44	218.1	220.4	227.4	7.0	68.1
FY 68	349	0.35	208.0	211.3	221.3	10.0	69.7
FY 69	267	0.32	216.3	217.9	215.0	-2.9	68.6
FY 70	173	0.42	207.8	210.4	221.6	11.2	67.1

the strains imposed by a slow-growing NIH research budget.[13] The increased concentration of research funds in the hands of a few schools reflects the strength of their research programs, not any bias toward established investigators in the grant renewal process. This increased concentration, and the fact that it rests on the evaluation of research proposals of scientific merit, will exacerbate the difficulties faced by the less competitive schools from any substantial reduction in other forms of federal support.

RESEARCH FUNDING, ENROLLMENT, AND THE GROWTH OF FACULTY

The salaries of full-time faculty account for a significant fraction of any medical school's budget. The number of such faculty has grown with exceptional rapidity since World War II, producing a concomitant increase in the faculty–student ratio. The research responsibility assumed by medical schools—and the availability of federal funding for research—is the most frequently cited explanation for this development.

To test this hypothesis, we relate the number of full-time faculty in our cross-section of 10 schools to the number of medical students, the number of basic science students, the number of house staff positions, and the amount of NIH research funding received (including training grants):[14]

[13] Subsequent reports will analyze the peer review system in more detail.

[14] Section VII suggests that the correct specification of this relationship involves interaction terms between research and teaching, if indeed there are any joint costs. For the cross-section in FY 1968 we do not have enough data points to estimate this many parameters. We are in the process of assembling data for all schools that will allow the inclusion of interaction terms, and if the data can be obtained, the results will be presented in future reports. We also recognize that the actual number of house staff might be a superior specification to number of house staff positions, but these data are not yet available either.

$$N = n + b_1E + b_2G + b_3H + b_4A \quad (3)$$

where N = the number of full-time faculty
n = a constant term
b_1 through b_4 = the regression coefficients
E = total medical student enrollment
G = graduate student enrollment
H = house staff positions
A = NIH awards for research and research training.

The hypothesis is tested at the approximate peak of NIH research funding (FY 1968), using data from the AAMC faculty roster and the NIH IMPAC file. Equation (1) is applied separately for each major type of department; thus N, G, H, and A refer to faculty, graduate students, house staff, and research awards specific to a department. The results are presented in Table 19. They indicate some support for the notion that, in the peak period of NIH activity, variation in department size is largely explained by differences in research funding, not by differences in undergraduate teaching responsibilities. Although it also appears that there was no significant relationship between faculty size and graduate education (in the form of graduate students or house staff), the evidence on this point is less clear. In four of the departments (microbiology, physiology, psychiatry, and radiology), graduate training and research awards are highly correlated ($r \geq .85$). Thus it is difficult to estimate the individual contribution of either variable.[15] Among the remaining departments, only in pathology is there any significant relationship between graduate education and department size.

To what extent does research funding explain the further growth of medical faculties since FY 1968? To test the hypothesis, we apply equation (1) to data on our 10 schools for the period FY 1968 through FY 1973 (a pooled cross-section time-series sample). Because we are interested in changes from the FY 1968 level, equation (1) is adjusted for the fact that each school started off with a different number of full-time faculty in FY 1968—we introduce a series of dummy variables, S_i, which take on the value one when the data apply to the ith school, and zero otherwise:

$$N = n + \sum_{i=1}^{9} a_iS_i + b_1E + b_2G + b_3H + b_4A \quad (4)$$

The effect of introducing the dummy variables is to shift the constant term, n, for each school.[16]

Results from the estimation of (4) are reported in Table 20, omitting the dummy coefficients. The results suggest that changes in department size since FY 1968 are not related to changes in research awards but rather are more closely linked to

[15] Were the graduate education variables omitted from these equations, the coefficients on research awards would all be significant at 5 percent; the coefficients on total medical students would remain insignificant.

[16] In actually estimating (4), one dummy is omitted, since for one school the constant term can be n. Thus i runs from 1 to 9, as written.

As noted in footnote 14, the correct specification of (4) would involve interaction terms. Our limited number of degrees of freedom makes it difficult to estimate this many parameters, especially because the interaction terms are highly correlated with the other explanatory variables. When we did try such specifications for the basic science departments, the results appeared somewhat unstable. For the clinical sciences, the majority of results were not different from those reported (in terms of the pattern of significant coefficients). If we are able to obtain data for a larger sample of schools, the specifications involving interaction terms will be presented in future reports.

Table 19

REGRESSION OF FULL-TIME FACULTY ON RESEARCH AWARDS AND ENROLLMENT, FY 1968

(Ten medical schools)

Department	R^2	Coefficient on Total Medical School Enrollment	Coefficient on Graduate Student Enrollment	Coefficient on House Staff Positions	Coefficient on Research and Research Training Awards ($000)
Basic Sciences					
Anatomy	.88	.0279[a]	.0930	--	.0078[a]
		(.0088)	(.1459)		(.0030)
Biochemistry	.86	.0028	.0571	--	.0081[a]
		(.0048)	(.0509)		(.0026)
Microbiology	.79	.0039	.0803	--	.0108
		(.0042)	(.2274)		(.0126)
Pathology	.92	-.0039	.1903[b]	.0701	.0196[a]
		(.0078)	(.0770)	(.0636)	(.0034)
Physiology	.64	.0171	.1308	--	.0078
		(.0123)	(.2028)		(.0145)
Clinical Sciences					
Medicine	.93	.0090	--	.0927	.0104[a]
		(.0128)		(.0481)	(.0025)
Ob-Gyn	.63	.0058	--	.4470	-.0005
		(.0119)		(.3373)	(.0164)
Pediatrics	.76	.0127	--	.3354	.0115[b]
		(.0161)		(.2670)	(.0058)
Psychiatry	.70	.0014	--	.1351	.1622
		(.0308)		(.2911)	(.1250)
Radiology	.76	.0101	--	.4618[b]	-.0424
		(.0143)		(.2341)	(.0814)
Surgery	.89	.0183	--	-.0252	.0176[a]
		(.0122)		(.0608)	(.0029)

[a] Significant at 5 percent.

[b] Significant at 10 percent.

changes in medical student enrollment. In only two of the eleven departments for which equation (4) was estimated is the coefficient on research awards significantly different from zero. In contrast, the coefficient on total medical students is significant in eight of the eleven equations.[17]

For the clinical sciences, changes in department size do not appear to be related to graduate training responsibilities, as measured by number of house staff positions.[18] For the basic sciences, however, department size and graduate students are

[17] To test the possible effect of changes in leadership, as indicated by changes in department chairmen, we modified equation (4), introducing a dummy variable in the year of a change and in all subsequent years. The hypothesis is that a new chairman may signal a decision to upgrade a department by adding new faculty members. The results of this simple specification were not promising. In two cases (medicine and surgery) the coefficient was significant but negative, suggesting that a change in chairmen was accompanied by an exodus of department members. Coefficients on the other variables were not substantially different from the results reported in Table 20.

[18] The significant negative coefficient on house staff positions in the medicine equation may, at first glance, appear anomalous, but it is not implausible. Although more attending physicians are probably

Table 20

REGRESSION OF FULL-TIME FACULTY ON RESEARCH AWARDS AND ENROLLMENT, FY 1968-FY 1973

(Ten medical schools)

Department	R^2	Coefficient on Total Medical School Enrollment	Coefficient on Graduate Student Enrollment	Coefficient on House Staff Positions	Coefficient on Research and Research Training Awards ($000)
Basic Science					
Anatomy	.95	.0173[a]	.1443[a]	--	-.0021
		(.0048)	(.0712)		(.0028)
Biochemistry	.96	.0191[a]	.0093	--	.0031
		(.0033)	(.0375)		(.0021)
Microbiology	.86	-.0004	.1263[a]	--	.0005
		(.0040)	(.0375)		(.0013)
Pathology	.92	.0393[a]	-0.2514[a]	.0134	-.0007
		(.0067)	(.07331)	(.0164)	(.0022)
Physiology	.97	.0063	.0531[a]	--	.0042[a]
		(.0042)	(.0251)		(.0018)
Clinical Sciences					
Medicine	.88	.3189[a]	--	-.5520[a]	.0057
		(.0380)		(.1667)	(.0054)
Ob-Gyn	.85	.0106	--	.0854	-.0143
		(.0075)		(.1296)	(.0102)
Pediatrics	.92	.0402[a]	--	-.0691	.0038
		(.0079)		(.0788)	(.0027)
Psychiatry	.97	.0733[a]	--	-.0793	.0093[a]
		(.0120)		(.0862)	(.0030)
Radiology	.92	.0550[a]	--	.2105[a]	.0067
		(.0110)		(.0855)	(.0041)
Surgery	.90	.1387[a]	--	-.1087	-.0025
		(.0189)		(.1599)	(.0045)

[a]Significant at 5 percent.

significantly related: in three of the five basic science equations the coefficient on graduate students is significant and positive.[19]

Although we are quite confident about the lack of relationship between federal research funding and faculty numbers, caution is advised in interpreting our finding of a strong relationship between faculty growth and medical student enrollment. Both are growing together over time, and the estimated relationship may be coincidental rather than causal. In other words, some third factor—also associated with time—may be generating the increase in faculty numbers. One example, applicable

required to teach additional house staff, house staff are also a substitute for faculty in the teaching of medical students. If this second effect is sufficiently strong, it can overwhelm the first. These opposing effects may help explain why the house staff variable is generally unsuccessful, except in radiology, which has limited responsibility for teaching medical students.

[19] The significant negative coefficient on graduate students in the pathology equation may reflect the substitution of graduate teaching assistants for faculty members, much as we argued might be the case in medicine (see footnote 18).

to the clinical sciences, would be the initiation of Medicaid and Medicare programs, which might have allowed medical schools to shift faculty from volunteer or part-time status to full-time positions.

It is nonetheless interesting to see what these results can tell us about recent trends in faculty-student ratios. Table 21 presents, by department, the average FY 1968 faculty-student ratios at the 10 schools in our sample. From the regressions reported in Table 20 we have estimates of the marginal faculty-student ratios at the same 10 schools (that is, the number of faculty added for each additional student enrolled, if other factors were held constant). For the basic sciences these are generally lower than the average, indicating that, in the absence of other changes, enrollment expansion is accompanied by a fall in the average ratio. In contrast, for clinical departments, the marginal ratio is higher than the average, indicating that full-time faculty grow at a more rapid rate than medical students as enrollment expands.

The marginal faculty-student ratios of Table 21 encourage an optimistic view of the current funding requirements of medical education. First, the lower are marginal faculty-student ratios in the basic sciences, the more likely that medical schools are exploiting the economies of scale inherent in didactic instruction—the fact that class size can be increased with little or no addition to the faculty. Second, the very high marginal faculty-student ratios in the clinical sciences indicate that, as Section VII suggests, an effort is being made to reduce the funding requirements of medical education by increasing the numbers of clinical faculty.

Table 21

AVERAGE AND MARGINAL FACULTY-STUDENT RATIOS

Department	Average FY 1968	Marginal FY 1968-73
Basic Sciences		
Anatomy	.031	.017
Biochemistry	.028	.019
Microbiology	.022	(.000
Pathology	.039	.039
Physiology	.035	(.006)
Clinical Sciences		
Medicine	.104	.319
Ob-Gyn	.023	(.011)
Pediatrics	.038	.040
Psychiatry	.064	.073
Radiology	.036	.055
Surgery	.055	.139

( ): Not significantly different from zero.

SUMMARY

The 1971 health manpower legislation was designed to deal with the institutional problems of academic health centers and to influence those institutions' decisions. The principal institutional problems were the operating deficits that seemed to threaten the financial viability of a growing proportion of the medical education community and had spawned a financial distress grant program that had become an administrative nightmare for HEW. At the same time that the administrators were becoming preoccupied with the institution's deficits, policymakers were becoming concerned with bringing about changes in the institutions that would expand enrollment, shorten the curricula, improve the equality of access to medical careers, and eventually alter the structure of the health care delivery system.

Given the nature of the problems and the objectives, it is not surprising that the principal program instrument of the 1971 act was the institutional grant. The responsibility for dealing with financial problems and the authority to make the changes desired by policymakers rested largely with the central administration of the centers. Although individual departments bore substantial responsibility for "selling" their services (research "purchased" by grants and contracts and patient care provided in the center's clinical facilities), the responsibility for covering pure education costs and unfunded joint costs fell to the dean or vice president. Funds not earmarked for a specific purpose were generally scarce—particularly in private schools. The lack of such funds made deficits difficult to handle and initiatives difficult to undertake. Under such circumstances, it is understandable why the administrators of academic health centers were responsive to the incentives provided by federal institutional grants. Moreover, the federal incentives were reinforced by broader social concerns over the high costs of health care and the barriers to access to medical careers.

While analysis of medical school admissions and data on enrollment and curricular innovation provide substantial evidence that the programs of the 1971 act were successful in bringing about some important institutional changes, their lasting effect on the financial status of institutions is less clear. To be sure, the first dollar financing of capitation eliminated the need for the last dollar financing of distress grants for all but six medical schools in fiscal year 1972 and seven schools in 1973. However, an objective of the 1971 act was to remove the underlying causes of operating deficits, not simply to replace one kind of funding with another.

Program interdependencies make it difficult to identify unambiguously the sources of financial problems (see Section VII above). Although our analysis of data to determine the causes of financial distress does not yield a model with high explanatory, much less high predictive qualities, it suggests that the causes of financial difficulty may not be transitory. The statistically significant explanatory variables are things over which the institution appears to have little or no control: state or private status, success in the NIH grant awards process, and the size of population base relative to the medical student population.[30]

In theory, a center may substantially improve its competitive position in the NIH grant process and some centers have been able to do so. However, since our data show that the top research centers have been able to hold their own in the NIH competition in the face of tighter research budgets, a significant redistribution of research awards in the favor of formerly "financial distress" schools seems unlikely. Our analysis suggests that the unlikelihood of redistribution stems not from a bias

[30] A fourth significant variable, the ratio of volunteer faculty to full time faculty, is not properly speaking an explanatory variable, but instead it shows how a center in difficulty attempts to accommodate to financial stringency.

in the peer review process favoring established investigators but rather from the inherent advantages of working in a research intensive environment.

During the 1950s and through the mid 1960s, when federal biomedical research funding was growing rapidly, success in the NIH research competition appears to have substantially influenced the size of individual departments both within a particular school and across schools. Our analysis shows that in 1968, the size of most basic science departments and the largest clinical departments (medicine and surgery) were significantly affected by the particular department's success in obtaining NIH grants. However, as NIH research funding began to level off, success in the research grant competition ceased to be an important determinant of department growth.

As federal programs focused on objectives involving institution-wide action, such as enrollment expansion and curriculum change, the variables relating to institution-wide educational programs replaced department specific variables of research success as the important determinants of department growth. Thus, the federal institutional grants of recent years appear not only to have induced changes in educational programs and admissions criteria but also changes in the nature of institutional growth.

IX. CONCLUSIONS

FINDINGS OF THIS REPORT

The Comprehensive Health Manpower Training Act of 1971 sought to increase the number of health professionals in the United States. In support of that goal, it also sought to insure the fiscal stability of the health professions schools. For medicine, substantial progress has been made on meeting the first objective. By 1977–78, in large measure as a result of federal encouragement, the number of first-year medical school places will have increased more than 25 percent over 1971–72. Viewed over the decade during which enrollment expansion has been a principal federal concern, the increase is even more dramatic: Between 1965–66 and 1977–78, the number of first-year medical school places will have increased by more than 75 percent. For the increases already achieved (1972–73) this is an annual growth rate of 6.6 percent, sharply greater than the rat of 1.3 percent per year between 1950–51 and 1965–66.

The cost to the federal government of this change has been quite modest. Between 1965–66 and 1972–73, federal support under programs to underwrite medical school operating costs totaled $505 million, and support under programs to pay construction costs totaled $610 million. (Data for FY 1974 are not yet available.) The operating support monies paid through 1972–73 represent less than 10 percent of the federal funds provided medical schools in this period.[1]

Although initially (1963) the intervention of the federal government was prompted by concern for the output of physicians—and to a lesser extent the output of dentists—in practice legislation enacted has included most of the health professions. To the extent this support represents the political price extracted by other health professions to allow federal construction and operating cost support to the medical schools, it substantially increases the cost of expanding medical school enrollments. Such political requirements significantly blunt the federal government's policy instruments.

For medical schools, the response to federal incentives has differed somewhat between public (state) and private institutions. Among schools existing when the federal government began to encourage enrollment expansion, the response from public and private schools has been approximately equal. However, a substantial share of the federal investment was directed to starting new schools. Here the response came primarily from state institutions, not private organizations—only five of the 23 new schools are private. This differential response can probably be explained by the matching requirement of the federal construction programs; states were more likely to be able to provide the matching funds than private universities or medical centers. Because state school admissions policies tend to discriminate in favor of residents, the differential response has important implications for access to medical education.

In a discussion of access to medical education, it is important to note the responsiveness of admissions policy to concerns about opportunities for women and disadvantaged minorities. Estimated logit equations that describe the admissions process at the schools in our sample show that the strong discrimination faced by women as recently as 1969 had disappeared by 1972. For minorities, these estimated equa-

[1] Total excludes patient care reimbursement.

tions reveal that minorities are often evaluated for admission by quite different criteria than are other students; one frequent difference is that standard tests, believed by many to discriminate against minorities, are *not* used to make minority admissions choices. Although these changes in admission policy may be partly responsive to federal concerns and the availability of federal funds to finance special programs for minorities, discussions with admissions committees and other medical school officials reveal that a large part of the change originated from within the schools themselves, and in response to general trends in American society, reinforced by the leadership of the AAMC and the AMA.

The substantial federal interest in expanding enrollment has changed the pattern of institutional growth. Whereas in the past the numbers of faculty depended largely on the size of the research program, since the late 1960s changes in department size have been related to changes in educational responsibilities, not research effort. In the basic sciences, the marginal faculty-medical student ratio is substantially below the average ratio in 1967–68, perhaps indicating that schools are taking advantage of the economies of scale that are possible in the teaching of the first two years of medical school. (This phenomenon may also reflect changes in the curriculum, especially the emphasis on organ-system approaches, and therefore an increased demand for clinicians as teachers.) In contrast, the marginal faculty-student ratio in the clinical sciences has been substantially above the average. Rising clinical faculty-student ratios may be related to increased third-party insurance programs (especially Medicare and Medicaid), which have changed the status of physicians' affiliations with medical schools. However, these rising faculty-student ratios may also reflect an effort by the medical schools to have clinical activities pay a larger share of the joint costs of medical education.

Should the federal government in the next round of manpower legislation elect once again to encourage the expansion of enrollment, most medical schools would be responsive to incentives of the current magnitude. Finding qualified students would not prevent further enrollment growth, since the national pool of applicants now contains more qualified applicants than can be accepted. Many of these now seek medical education abroad. However, state schools that discriminate heavily in favor of state residents and draw from a small resident population might find it difficult to maintain the quality of their students without revising their admissions policies.

The conclusion that further enrollment expansion is possible includes several caveats. Some schools would be constrained by operating funds, and some would be constrained by their present physical facilities. In the past, federal construction funds have proved a highly successful instrument for removing this constraint. The present administration's preference for using private capital markets rather than public funds may make this more important in the future than it has been in the past. A very serious constraint for some schools would be the availability of teaching patients.

Although the effects of the Comprehensive Health Manpower Training Act of 1971 on the expansion of enrollment can be rather well assessed it is more difficult to evaluate its effects on the fiscal position of the medical schools. No medical school lost manpower training money as a result of the 1971 act; however, the distribution of available federal funds changed so as to favor those not previously in financial difficulty at the expense of those who had financial problems in the past. Schools previously characterized as being in financial distress, presumably the ones with the most limited resources, received a much smaller share of federal monies under the 1971 act. State schools in financial distress may have been the most serious losers, since the requirements for continued state support mandated by the capitation

program did not take into account the prospective growth of state support, especially for new schools. States could meet the provisions of the act by maintaining past levels of support and still reduce future commitments. These commitments would probably have been honored in the absence of a capitation program. Thus one effect of capitation was to provide a limited degree of revenue sharing, with federal support replacing state monies that might otherwise have been forthcoming.

In view of the federal concern with fiscal stability of the medical schools, we have attempted to make a direct analysis of the factors that lay behind financial distress. No surprisingly, we find that controlling for other factors, private schools were more likely to receive a larger financial distress award than public schools and that a lower fraction of NIH grants approved is also associated with larger financial distress grants. The ratio of population to medical students is negatively related to the size of award, indicating that the financial status of the hospital may play a role. None of the variables that directly measure the size of the education program are significant in explaining financial distress.

The finding that past financial distress was related to a weak research program is particularly significant because of the potential use of research funds to cover more of the joint costs of medical education were current federal support of operating costs reduced. We believe that the schools most likely to need this substitution would be unlikely to succeed in such an effort. Analysis of priority scores indicates that despite the dramatic change in the real growth rate of NIH research monies during the late 1960s and early 1970s, the integrity of the peer review process was maintained. As a result, schools with strong research faculty received a larger share of the limited research funds.

More generally, our analysis of the factors related to financial difficulty in the past suggests that none of these can be easily changed in the short run. While the 1971 act successfully replaced the financial distress grant as a mechanism for channeling funds to the medical schools, the factors underlying financial difficulty could not be treated with the policy instruments contained in that legislation. Were the current capitation grants substantially reduced and no substitute offered, a number of schools might once again find themselves seeking special support from the federal government.

The administration proposes that increased tuition eventually substitute for direct federal grants to support operating costs. This is one of three concerns with tuition policy. A second relates to the burden sharing of educational costs among the government, the student, and other parties. A third is the effects of different tuition levels on the mix of students entering medical schools and the nature of their practice when they enter the profession.

Because of the joint cost problem, analyzing the "cost" of medical education is not very helpful in deciding what students should pay. This does not mean, however, that there is no basis for redistributing the financial burden of medical education. If those qualified to enter the medical profession weigh the cost of the education to them against the evidence of expected lifetime earnings provided by today's physician incomes, they would conclude on purely economic grounds that the investment was sound—even at substantially higher costs. The criterion for sharing the burden can then be put quite simply: tuition can be raised so long as sufficient qualified students are still willing to seek a medical career. Among other things, that will depend on the opportunities to borrow against future earnings at reasonable interest rates. Providing such opportunities serves an important social goal—allowing the qualified student to seek medical education regardless of family income.

Although the administration is proposing to use economic returns as a rationale for shifting the financial burden of medical education from the taxpayers to the

medical students, it is not proposing to relegate specialty and practice location decisions to market forces. In fact, by increasing the size of the educational burden to be borne by the individual, the government expects to gain more leverage to influence individual decisions through scholarships and loan forgiveness. The effectiveness of such a policy is difficult to judge in advance, but the administrative problems of developing criteria for assistance seem substantial.

EXPECTED RESPONSES TO CUTBACKS IN FEDERAL INSTITUTIONAL GRANTS

The pattern of federal health manpower programs has been to use institutional grants to induce substantial changes in the academic health centers, changes largely related to increasing the aggregate supply of physicians. Now the administration predicts that the enrollment expansion already achieved is sufficient to meet the nation's physician needs by 1985. It proposes "to maintain present enrollments but also to gradually shift the method of support for medical education from general institutional operating subsidies to direct assistance to medical students."[2]

The grants that induced changes in the centers also presumably increased the reliance of those institutions on the federal government. Therefore, the institutional responses to proposed federal cutbacks are both of significant policy interest and difficult to predict. What we offer below is educated speculation about the nature of such changes.

Unlike the 1971 legislation, which required enrollment expansion as a condition for receiving institutional grants, the 1974 proposals for reducing institutional support in favor of direct student assistance apparently will not mandate specific action on the part of academic health centers.[3] To be sure, reduced funding will require some action on the part of each center. However, that action can come in the form of changes in programs or shifts to greater reliance on alternative sources, only one of which is the student on whom the federal government wishes to place more of the burden of financing medical education.

Although shifts to alternative funding sources and program changes are likely to occur simultaneously, we will consider the former first because it is the change preferred by both the government and the institutions. Besides the federal government, the principal sources of institutional funds are state appropriations, tuition receipts, and earnings from clinical faculty practice.[4]

State government appropriations are the largest source of institutional support for most, if not all, state schools, and state subsidies are becoming increasingly important to private schools.[5] Therefore, we would expect all public schools and

[2] "Proposals for Improving Health Care," p. 4.

[3] The exception may be to maintain enrollment as a condition of receiving reduced institutional grants.

[4] In recent years, the federal government has provided institutional funds through a number of programs in addition to capitation and its predecessor formula grants. These include financial distress grants, general research support grants, and indirect costs support from research grants. None of these three seems a likely candidate to compensate for capitation cutbacks: recently financial distress grants have been available to only a half dozen or so schools with peculiar financial problems; general research support grants have been cut back sharply, and tight budgets and stiff competition for NIH research funds make substantial growth in the indirect cost component of grants unlikely.

[5] In 1972, state legislatures provided about $334 million for the operation of medical schools. About $40 million was provided to private schools and the remainder to 65 public schools. Robert Carow, "State Roles in Financing Medical Education," *Journal of Medical Education*, Vol. 48, No. 1, October 1973, p. 959.

many private schools to seek to replace federal institutional support with state funds. Because tuition rates at most state schools are decided at the state administrative level rather than by medical school administrators, these schools will have little choice but to ask for more state funds or at least to present the direct appropriation/tuition increase option to the appropriate state body. The private schools that approach state governments for funds will almost surely have to bargain medical school places for residents for state dollars.

It is difficult to predict how state legislators and administrators will respond to medical school requests for more money. As the competition for medical school places has increased, state legislators have become increasingly interested in the political side of medical education—constituents concerned about getting their sons and daughters admitted to a prestigious, high paying profession. For these reasons, as well as concern over physician shortages, there has been a substantial increase in the number of public schools (see Section III). Federal start-up assistance and construction and capitation grants have made the growth of medical school places less costly to the states than would have been the case in the past. Because of the commitment to these institutions and constituent interest in educational opportunities for their children, we would expect the appeal to state governments to yield funds to fill part of the gap left by reductions in federal institutional aid. However, the price of increased state support will almost surely be increased discrimination in favor of residents in medical school admissions.

The federal government apparently would prefer that the schools replace federal funds with increased tuition receipts. However, as we have indicated above (see Section VI) the state schools' capacity to change is constrained by state governments, and the private schools' capacity to change is constrained by the need to compete for good students with their state counterparts. Apart from an interest in attracting good students, both public and private schools seem firmly committed to keeping costs within the bounds that the applicants they accept not only can, but will, finance. Thus the amount and terms of student aid that the federal government makes available can be expected to influence tuition decisions. Private schools that now have fairly low rates may raise their tuition to levels near the top of the private scale (about $4,000), thus increasing the average spread between public and private schools. However, on balance, we expect changes in tuition rates to proceed slowly with state school rates serving as a brake to growth.

The third important source of institutional funds, clinical faculty practice income, is provided in two forms: One is the contracts many schools have to provide clinical staff to local or state government-operated hospitals. These contracts are negotiated periodically to adjust to market forces, but the underlying principle of cost reimbursement provides little latitude for the schools to increase operational revenue except to cover cost increases clearly attributable to the hospital's programs. The other form is the faculty practice plan. These vary in pattern from school to school and department to department, but they usually have in common characteristics that result in a division of income among the individual faculty member, his department, and the dean.[6]

This latter form of practice income is a logical source from which to replace part of the loss of institutional support from the federal government. As we have discussed above, faculty practice earnings have been the fastest growing source of general operating support in recent years, but increasing these revenues further will

[6] The bases for the individual's share range from the very explicit (as where the dean's and department's shares are determined by a withholding schedule) to the implicit (as where the individual is on a straight salary, part of which is provided from the department's group practice earnings).

require hard bargaining on the part of deans (see Section VII). Since the earning capacities of departments vary, the relative strengths of departments will almost surely be changed where this form of revenue is used to replace government funds.

As this suggests, the future financial position of the academic health centers will be strongly affected by changes now being considered in federal health programs and policies in areas other than health manpower. Reductions in federal support of research and graduate education programs, the proposed revisions of Medicare professional reimbursement rules, and hospital price controls will also result in a substantial increase in the funding requirements for existing undergraduate medical education programs. If the resources formerly supported under these programs (and jointly utilized by the programs being cut back and the undergraduate education program) cannot be funded from other sources, the core education programs will either have to be reduced or changed, or a higher "price" (in terms of forgone income) will have to be exacted of the faculty for the "privilege" of teaching and research. The two changes in existing or proposed federal health policy that would have the strongest beneficial side-effects on the funding requirements of undergraduate education programs are a reconsideration of the proposed revisions in the Medicare professional reimbursement rules and the recognition in the regulations of the Cost of Living Council that increases in the costs of education programs are in certain instances a valid basis for exception to overall hospital price constraints.

Although the federal government has clearly demonstrated its concern for the financial viability of academic health centers, that concern logically stems from its interest in the programs of the centers. The program effects of the cutbacks in federal institutional support will occur not only in those cases where centers are unable to replace federal funds but also in cases where centers are able to replace the funds, because of the conditions created by the replacement itself.

Since access to the reduced federal support will apparently be contingent upon maintaining existing enrollment, we would not expect medical schools to reduce their class size.[7] However, the composition of classes may be affected, and we have already speculated that increased reliance on state support will result in increased discrimination in favor of residents. Since the schools appear to have fully embraced society's concerns for equality of access for minorities and women, we have no reason to expect that a shortage of funds or a change in sources of support will cause them to give up those objectives.

In the case of women, the high quality of the applicant pool requires no special expenditure to maintain equality of access. However, in the case of minorities, equality of access has been interpreted by the schools, as well as by the federal government, to require them to search actively for candidates, to do extensive pre-admissions screening, and to admit individual applicants who will predictably require special tutoring in the early years of medical school. The real costs of these minority programs are substantial, though they have often not been identified in an accounting sense. In some schools, part of these costs have been covered by federal aid or private grants, but our impression is that most have been covered from general institutional funds. Thus tighter institutional budgets may cause some schools to devote somewhat fewer resources to special minority programs in the absence of offsetting federal grants targeted for this purpose.

The basic science departments seem most likely to suffer under tighter institutional budgets because faculty in those departments have only limited opportunities

[7] There are also other strong forces that favor maintenance of class size: the state governments that shared the burden of enrollment expansion, the alumni that want their sons and daughters to get into medical school, the school itself that needs the tuition revenue, albeit meager, to cover fixed costs associated with the original expansion.

for support from other sources. The cutbacks in federal institutional support will add to other forces operating against basic science programs: the cutbacks in federal training programs, the leveling off of NIH basic research efforts, and changes in curricula that place increased reliance on clinical faculty for instruction in the first two years of medical school. However, we must modify our prediction in the case of those schools that have irrevocable commitments to basic science departments with high proportions of tenured faculty. Such schools may change programs to try to utilize the faculty resources they are committed to maintain.

If medical school deans seek to compensate for federal cutbacks by increasing institutional revenue from faculty practice, as we expect they will, the education and care programs of the clinical departments will be directly affected. The structure of third-party reimbursement for professional services is such that the surgical and procedurally oriented medical subspecialties have the greatest earning capacity, particularly in the academic health centers. To increase revenue from patient care, the composition of the patient population in the teaching hospitals will have to shift to include more patients who require the services of the high paying specialties. The shift will necessitate more concentration on secondary and tertiary care and less on primary care. Other things equal, faculty growth in the clinical departments can also be expected to favor the high earning specialties, those generally not involved in primary care.

Another effect of tight institutional budgets may be seen in the area of teaching hospital affiliation. The present federal price control regulations for hospitals make it difficult for schools to develop new clinical teaching facilities.[8] To be reimbursed by third parties for nominally educational costs in the same manner as existing teaching hospitals, a would-be teaching hospital must change it cost allocation process in a way that requires special dispensation by the Cost of Living Council. The problems involved in obtaining such relief discourage application. The alternative is for the hospital to seek support from the institutional budget of the medical school, a source that is also unlikely to be of much help in the circumstances of proposed federal cutbacks.

The ambulatory care activities of most academic health centers do not generate enough income to cover costs. Hence these functions have to be subsidized by other institutional funds. In addition, faculty time devoted to ambulatory care generates less income than an equivalent amount of time devoted to in-patient care. Thus, as institutional funds become more scarce, the ambulatory care programs will need to be financed by other means or be cut back.

In summary, our expectation is that where institutional budgets become strained, programs involving primary care are particularly likely to suffer in the absence of offsetting government action. The federal government clearly plans to provide special project support for primary care programs. However, it seems unrealistic to expect that all the special project funds will be used to expand such programs. Given the budgetary incentives to minimize involvement in primary care, the major effect of special project grants may be to prevent cutbacks in primary care programs. Institutions that do not receive this type of grant are likely to encounter difficulty in maintaining their present level of effort in primary care programs.

[8] Most new affiliations are likely to be in general hospitals with relatively large primary care components since medical schools typically have already established affiliations with hospitals that have large secondary and tertiary care patient populations.